DIGITAL PACK TEST·MULTI SP

Instruction manual

[11th Edition]

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■ The contents of this instruction manual are subject to change without notice.

■ The specifications of this product are subject to change without notice.

■ Changes and additions to analyte will be reported via our website or other media as needed.
https://kyoritsu-lab.co.jp/english/index.html

1. Instruction

Thank you for purchasing DIGITALPACKTEST·MULTI SP (model: DPM-MTSP).
This product is incorporated with calibration curve data that have been obtained by using PACKTEST or other reagents and enables simple measurement of the concentration of analyte in a sample.
Read this instruction manual before use to thoroughly understand the functions of this product for proper operation.

2. Precautions for Use of Reagent

Use reagents made by KYORITSU CHEMICAL-CHECK Lab., Corp. As the reagent varies depending on the analyte, refer to the instructions. Use a reagent after reading the instructions, the GHS symbols, and SDS. For precautions and the relevant first aid method on reagent prepared by the user, refer to the SDS supplied from the manufacturer.

< Safety measurement >

- Thoroughly clean the hands before and after measurement. Do not inhale or contact the reagent.
- Wear PPE such as protective gloves, protective goggles, and mask as much as possible.
- Do not leak reagent or waste liquid into the surrounding environment.

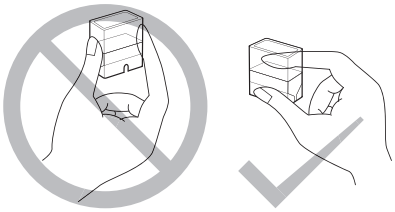
< First aid >

If reagent or solution **enters your eye**
→ immediately wash your eye with water for 15 minutes or longer.
Immediately consult an ophthalmologist even if you do not experience any pain or abnormal symptoms.
If reagent or solution **contacts your skin or clothing**
→ immediately rinse the skin or clothing with water.
If reagent or solution **enters your mouth**
→ immediately rinse your mouth with water.

If you have swallowed reagent or solution or you experience any abnormal symptoms after receiving the above treatment, immediately consult a doctor.
For details, refer to the instructions for the reagent or the SDS.

< Storage > Store reagent in the dry and dark place at room temperature beyond the reach of children.
< Disposal > Appropriately dispose of reagent according to the relevant laws and regulations.
< Others > Before using a reagent, check its expiration date. Measurement using a reagent beyond its expiration period is invalid.

3. Precautions for Handling of Cell



Use PACKTEST Square Cup as a cell. For some analytes, Round Cell is used as a reaction container.

1. Use "PACKTEST Square Cup" (model: WAK-CC10) as the Cell.
2. Use the same Cell in steps from zero adjustment to measurement.
3. The side faces of the Cell serve as an optical path. Do not hold the faces where light passes with your hand.
4. If the water temperature is significantly lower than the ambient temperature, dew may be condensed on the Cell to cause turbid and abnormal measurement value.
5. When setting the Cell in the cell box, cleanly wipe its surface so as not to leave water droplets or finger prints, and then gently put it the cell box.
6. When setting the Cell in the cell box, remove the cap of the cell to prevent the leak.
7. After measurement, take out the Cell or Round Cell, clean it with pure water, because reagent or other substances remaining in it may cause a measurement error in the next measurement. If pure water is not available, thoroughly rinse it with tap water, and then clean it with the sample before conducting the next measurement.
8. As a flaw or dirt on the Cell causes a measurement error, replace the Cell with a new one as necessary.
9. The material of the Cell and that of Round Cell are as follows. Dispose of them according to the relevant instruction of the local government.

Sort of cell	Material of cell	Material of cap
PACKTEST Square Cup	polystyrene	polyethylene
Round Cell	glass	polypropylene (PP)

10. Values displayed when the Cell is not set in the cell box are i nvalid.

4. Precautions for Measurement

1. As a basic measurement method, put the sample in PACKTEST Square Cup, cancel the sample color as of before measurement by pressing【Zero】, and then press【Start】after sucking the sample into the tube or adding the specified reagent. Have the reagent react with the sample by lightly shaking to produce a solution, and put the Cell to which the solution has been returned in the cell box within the reaction time. Then, the result is automatically displayed when the reaction time ends.

2. As the measurement reagent, the PACKTEST, Reagent Set for Water Analyzer or an analysis set of varying type is used depending on the analyte. When performing measurement by using PACKTEST or an analysis set of varying type, also carefully read the instruction for the reagent. Note that the reaction time, measurement range, and influence of coexistent substance differ between the case where the Standard Color and the color development are visually compared and the case where measurement is conducted by using this measurement device. Also, depending on the analyte, a special pretreatment method, a tool (sold separately) or a reagent (sold separately or separately procured by the customer) may be required. Carefully read "8. Measurement Methods".

3. Adjust the pH of the sample within the pH range specified for the analyte. As the reagent contains pH buffer, pH adjustment of a sample near neutral is unnecessary, but be sure to neutralize a strong acid or strong alkali sample, in particular an acidified or alkalized sample.

4. If the sample is excessively turbid or colored, zero adjustment may not be possible. Perform filtration, dilution, and the like as necessary.

5. The reagent may not be completely dissolved. This does not affect color development, but floating of the reagent in the solution or attachment of the reagent to the wall surface of the Cell causes a positive measurement error. Therefore, place the Cell during reaction time. If remaining undissolved reagent or bubbles have attached to the wall surface of the Cell, remove them as much as possible by, for example, snapping the Cell with your finger. Be especially careful if such attachment occurs on the low concentration because the error becomes larger.

6. Set the sample temperature to 15 to 30 ℃ for measurement. Note that for some analytes, temperature correction coefficients are listed. As the calibration curve and various data for DIGITALPACKTEST·MULTI SP have been created at 20℃ , measurement at 20℃ obtains better measurement data. If the sample temperature greatly deviates from the target temperature, perform measurement in any of the following methods.
   (1) Perform measurement after setting the sample temperature to 20℃ by using a temperature controlled bath or the like.
   (2) If a temperature correction coefficient is listed in the "CAUTION" column, multiply the measurement value by the coefficient for the temperature nearest to the sample temperature during measurement to obtain an approximate value.

7. A result can be estimated by the shading of the color development of the solution. If a measurement value could be obtained even when no color development occurred, there is a possibility of turbid due to change of pH caused by the color development reagent. Also, note that depending on the analyte, the color development may become pale if its concentration is excessively high or a measurement value may be obtained even from a sample exceeding the measurement range.

8. If a measurement value is out of the measurement range, "UNDER" or "OVER" is displayed.

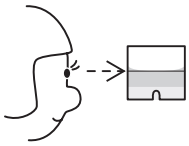
9. When the concentration of the analyte is considered to be high or when the result is above the measurement range, dilute the sample with pure water so that the result falls within the measurement range.

10. There are data on the influence of coexistent substance for respective items. If coexistent substance is considered to exert influence, perform measurement after an appropriate pretreatment according to JIS K 0102 or other standard. Depending on the type of coexistent substance, measurement may be impossible.

11. The result obtained by Photometry mode using PACKTEST etc. as measuring reagent is not certificated value. For first time use or when doubt about the result, you may need to check the correlation with official method.

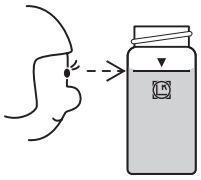
5. Basic Measurement Operation Procedures

The basic measurement operation procedures are explained below.



Fill the Cell with 1.5 mL of sample (up to line).

Place the Cell on a flat surface.
Move your eyes to the same height as the liquid level, and put the sample up to the point where the lower end of the liquid surface (meniscus) aligns with the line on the Cell.



Fill the Round Cell with 25 mL of sample (up to white line).

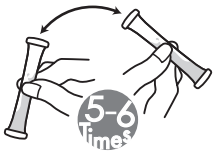
Place the Round Cell on a flat surface.
Move your eyes to the same height as the liquid level, and put the sample up to the point where the lower end of the liquid surface (meniscus) aligns with the line on the Round Cell.

Press the【 Zero】button.

Cancel the color of the sample as of before measurement.

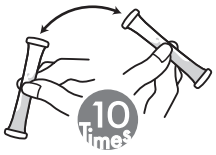
Press the【 Start】button.

Count down of the time set on "Reaction time" starts.
As soon as the reaction time ends, the absorbance is measured and the result is displayed.



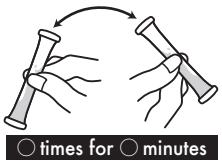
Lightly shake the tube 5 to 6 times.

Amount of the sample into the tube of PACKTEST, slowly overturn the tube so as not to spill the sample in it.



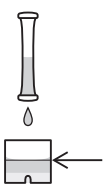
Shake the tube for about 10 times.

After sucking the whole amount of the sample into the tube of PACKTEST, slowly overturn the tube so as not to spill the sample in it.



Stir the sample for XX times in XX minutes.

After sucking the whole amount of sample into the tube of PACKTEST, overturn the tube at the speed of about one reciprocation per second so as not to spill the sample in it.



Return the sample to the Cell when the time count down reaches under XX minutes.

As bubbles are generated during reaction and they are likely to attach to the wall surface of the Cell, return the solution from the tube of PACKTEST to the Cell XX minutes before the end of reaction time.

Snap the Cell with your finger to remove the bubbles on the wall surface.

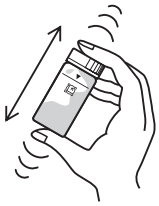
If bubbles remain after returning the solution to the Cell, snap the Cell with your finger to remove the bubbles on the wall surface.

Wait for XX minutes.

The waiting time is displayed inside the mark.
Wait after placing the Cell or the Round Cell on a flat surface.
Or place the tube after shaking.

Stir 5 to 6 times.

Hold the top part of the Round Cell and stir the solution in a circular motion.



Shake 5 to 6 times.

Vertically shake the Round Cell 5 to 6 times so that the liquid in it is well mixed.

Immediately shake strongly for approx. 10 seconds.

Attach the cap immediately after adding the reagent, and shake the Round Cell strongly for approx. 10 seconds at the speed of about 2 reciprocations per second.

6. List of Analytes and List of Reagents

As a major reagent, PACKTEST (sample amount: 1.5 mL, model: WAK -), Reagent Set for Water Analyzer (sample amount: 25 mL, model: LR -), analysis set of varying types (model: WA -), and DPR reagent for water analyzer (model: DPR -) are used.

Analyte		Range(mg/L)	Reaction Time	Reagent Model	Note / Necessary instruments
Al	Aluminum	0.05 ～ 0.40	5 min	LR-Al	
As	Arsenic	0.20 ～ 3.00	[30 min]	DPR-As	
As-D	Arsenic(Low Range)	0.009 ～ 0.200	[12 min]	SPK-As(D)	
B-C	Boron(High Range)	5.0 ～ 80.0	12 min	WAK-B(C)	
B	Boron	0.50 ～ 6.00	40 min	WAK-B	
Cd	Cadmium	0.003 ～ 0.035	[5 min]	SPK-Cd	
Cl-500	Chloride(High Range)	20 ～ 500	3 min	DPR-Cl	
Cl	Chloride	2.0 ～ 50.0	3 min	DPR-Cl	
ClO-C	Residual Chlorine(High Range)	2 ～ 500	1 min	WAK-ClO(C)	
ClO-DPD	Residual Chlorine(Free)	0.05 ～ 3.00	1 min	WAK-ClO·DP	
T-ClO	Total Residual Chlorine	0.05 ～ 3.00	2 min	WAK-T·ClO	
ClO_2	Chlorine Dioxide	0.20 ～ 6.00	30 sec	WAK-ClO_2	
$NaClO_2$	Sodium Chlorite	2 ～ 500	1 min	WAK-$NaClO_2$	
$NaClO_2$-D	Sodium Chlorite(Low Range)	0.10 ～ 2.00	1 min	WAK-$NaClO_2$(D)	
CN-2	Free Cyanide	0.01 ～ 1.00	10 min	WAK-CN-2	
CN^T	Total Cyanide	0.1 ～ 3.0	[30 min]	LR-CN^T	Water Analysis Set: Total Cyanide
CN^T-D	Total Cyanide(Low Range)	0.005 ～ 0.150	[50 min]	LR-CN-B	CN^T-RA
COD	COD with KMnO4	2.0 ～ 10.0	10 min	LR-COD-B-2	
Color	Color	50 ～ 1000deg.	0 min	—	
Cr^{6+}	Chromium(Hexavalent)	0.05 ～ 1.50	2 min	WAK-Cr^{6+}	
Cr^{6+}-D	Chromium(Hexavalent) (Low Range)	0.003 ～ 0.100	[10 min]	DPR-Cr^{6+}D	
Cr^T	Total Chromium	0.05 ～ 1.50	[12 min]	WAK-Cr^{6+}	Cr-RA
Cu	Copper	0.10 ～ 5.00	1 min	WAK-Cu	
Cu-M-2	Copper(DDTC)	0.5 ～ 10.0	2 min	WAK-CuM-2	
DET	Anionic Surfactants	0.05 ～ 1.20	[3 min]	WA-DET	
F	Fluoride(Free)	0.40 ～ 1.50	10 min	WAK-F	
Fe	Iron	0.10 ～ 5.00	3 min	WAK-Fe	
Fe-D	Iron(Low Range)	0.05 ～ 2.00	3 min	WAK-Fe(D)	
Fe^{2+}	Iron(Divalent)	0.10 ～ 5.00	3 min	WAK-Fe^{2+}	
Fe^{2+}-D	Iron(Divalent) (Low Range)	0.05 ～ 2.00	3 min	WAK-Fe^{2+}(D)	
Fe^{3+}	Iron(Trivalent)	1.0 ～ 50.0	1 min	WAK-Fe^{3+}	
FOR	Formaldehyde	0.20 ～ 1.00	5 min	WAK-FOR	
GLU	Glucose	0.5 ～ 20.0	12 min	WAK-GLU	
H_2O_2-C	Hydrogen Peroxide(High Range)	1 ～ 200	1 min	WAK-H_2O_2(C)	
H_2O_2	Hydrogen Peroxide	0.10 ～ 2.50	2 min	WAK-H_2O_2	
HYD	Hydrazine	0.03 ～ 1.00	20 min	WAK-HYD	
$KMnO_4$	Potassium Permanganate Consumption	2.0 ～ 10.0	10 min	LR-COD-B-2	Use the same Reagent as COD
MAL	M-Alkalinity	20 ～ 80	2 min	WAK-MAL	
PAL	P-Alkalinity	100 ～ 600	1 min	WAK-PAL	
Mn	Manganese	0.5 ～ 20.0	3 min	WAK-Mn	

Analyte		Range(mg/L)	Reaction Time	Reagent Model	Note / Necessary instruments
Mo	Molybdenum	5 ～ 150	2 min	WAK-Mo	
Ni-D	Nickel(DPM)	0.3 ～ 10.0	2 min	WAK-Ni(D)	
NH_4	Ammonium	0.20 ～ 5.00	10 min	WAK-NH_4-4	
NH_4-N	Ammonium-Nitrogen	0.20 ～ 4.00	10 min	WAK-NH_4-4	
NH_4-D	Ammonium(Low Range)	0.05 ～ 2.00	[40 min]	LR-NH_4-A-2	WA-NH_4-DR
NH_4-N-D	Ammonium-Nitrogen(Low Range)	0.05 ～ 1.50	[40 min]	LR-NH_4-A-2	WA-NH_4-DR
NO_2-C	Nitrite(High Range)	3 ～ 100	5 min	WAK-NO_2(C)	
NO_2-N-C	Nitrite-Nitrogen(High Range)	1.0 ～ 30.0	5 min	WAK-NO_2(C)	
NO_2	Nitrite	0.02 ～ 1.00	3 min	WAK-NO_2	
NO_2-N	Nitrite-Nitrogen	0.010 ～ 0.300	3 min	WAK-NO_2	
NO_3-C_1	Nitrate(High Range) (NO_2^-≤ 1 mg/L)	200 ～ 2000	5 min	WAK-NO_3(C)	
NO_3-C_2	Nitrate(High Range) (NO_2^-≤10mg/L)	200 ～ 2000	[10 min]	WAK-NO_3(C)	NO_3-RA, Heater
NO_3-N-C1	Nitrate-Nitrogen(High Range) (NO_2^--N≤0.3mg/L)	45 ～ 450	5 min	WAK-NO_3(C)	
NO_3-N-C2	Nitrate-Nitrogen(High Range) (NO_2^--N≤3mg/L)	45 ～ 450	[10 min]	WAK-NO_3(C)	NO_3-RA, Heater
NO_3_1	Nitrate(NO_2^-= 0 mg/L)	1.0 ～ 25.0	5 min	WAK-NO_3	
NO_3_2	Nitrate(NO_2^-≤0.2 mg/L)	1.0 ～ 25.0	[8 min]	WAK-NO_3	WAK-NO_2
NO_3_3	Nitrate(NO_2^-≤5mg/L)	1.0 ～ 25.0	[10 min]	WAK-NO_3	NO_3-RA, Heater
NO_3-N_1	Nitrate-Nitrogen(NO_2^--N=0mg/L)	0.20 ～ 5.80	5 min	WAK-NO_3	
NO_3-N_2	Nitrate-Nitrogen(NO_2^--N≤0.06mg/L)	0.20 ～ 5.80	[8 min]	WAK-NO_3	WAK-NO_2
NO_3-N_3	Nitrate-Nitrogen(NO_2^--N≤1.5mg/L)	0.20 ～ 5.80	[10 min]	WAK-NO_3	NO_3-RA, Heater
OIL-M	Mineral Oil in Water	5.0 ～ 60.0	[15 min]	WA-OIL-R	Water Analysis Reagent Set: Oil (resolution : 0.5 mg/L)
OIL-V	Vegetable Oil in Water	5.0 ～ 60.0	[15 min]	WA-OIL-R	Water Analysis Reagent Set: Oil (resolution : 0.5 mg/L)
OIL-S	Oil in Soil	400 ～ 5000mg/kg	[10 min]	SOA-OIL-RR	Soil Screening Refill Reagent Set: Oil (resolution : 100 mg/kg)
Pb-SPK	Lead(SPK)	0.03 ～ 0.50	[12 min]	SPK-Pb	
Phenol	Phenol	0.20 ～ 5.00	8 min	WAK-PNL	
Phenol-2	**Phenol**	**0.20 ～ 5.00**	**3 min**	**WAK-PNL-2**	**Released from June, 2023.**
PO_4-C	Phosphate(High Range)	2.0 ～ 50.0	3 min	WAK-PO_4(C)	
PO_4-P-C	Phosphate-Phosphorus(High Range)	0.7 ～ 15.0	3 min	WAK-PO_4(C)	
PO_4	Phosphate	0.10 ～ 5.00	3 min	WAK-PO_4	
PO_4-P	Phosphate-Phosphorus	0.03 ～ 1.50	3 min	WAK-PO_4	
PO_4-D	Phosphate(Low Range)	0.10 ～ 3.00	5 min	WAK-PO_4(D)	
PO_4-P-D	Phosphate-Phosphorus(Low Range)	0.03 ～ 1.00	5 min	WAK-PO_4(D)	
S	Sulfide(Hydrogen sulfide)	0.05 ～ 0.80	3 min	WAK-S	
SiO_2	Silica	3.0 ～ 60.0	8.5 min	WAK-SiO_2	
SiO_2-D	Silica(Low Range)	0.30 ～ 7.00	8.5 min	WAK-SiO_2(D)	
SO_4	Sulfate	5 ～ 100	3 min	DPR-SO_4	
TH	Total Hardness	10 ～ 150	1 min	WAK-TH	
TN-2	Total Nitrogen	0.5 ～ 7.0	[60 min]	TNP-N-R	Mini Autoclave Set Heater
TP-2	Total Phosphorus	0.10 ～ 2.00	[60 min]	TNP-P-R	Mini Autoclave Set Heater
Turbid-F	Turbidity(Formazine)	10 ～ 400deg.	0 min	—	
Turbid-P	Turbidity(Polystyrene)	10 ～ 100deg.	0 min	—	
Zn-D	Zinc(Low Range)	0.02 ～ 0.40	6 min	WAK-Zn(D)	

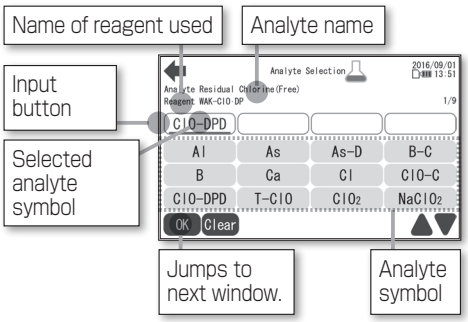
Reaction Time: [ ]are estimated reaction time including pretreatment procedure. Specifications subject to change without notice.

7. Normal measurement method

Photometry(1 item)

Selecting analyte

1. Press【Photometry】on [Main window].
2. [Analyte Selection Window] is displayed.
   Pressing【▼】brings you to the next page.
   Pressing【▲】brings you to the previous page.
3. Press the desired analyte symbol.
4. The analyte name and the name of reagent used are displayed, and the analyte symbol is displayed in an input button.
5. Pressing【OK】brings you to [Photometry Window].

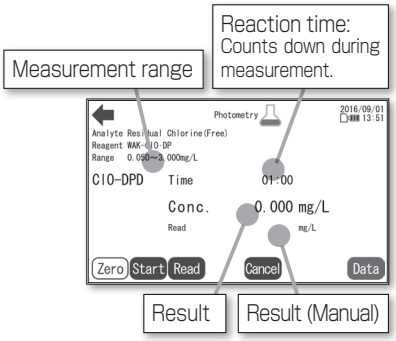


Canceling analyte

1. Press an input button on which the desired analyte symbol is displayed.
2. Pressing【Clear】clears the contents of the input button and the analyte is canceled.

Performing zero adjustment

1. Fill the Cell with the sample.
2. Put the Cell in the cell box.
3. Press【Zero】.
4. When the zero adjustment finishes, the color of【Zero】is inverted.
   "0" is displayed in the result display area.



- Zero adjustment can be performed any number of times.
- During measurement,【Zero】is disabled.
- After measurement, the color inversion of【Zero】returns to the original state.

Performing measurement

1. After zero adjustment, mix the sample with the reagent. At the same time, press【Start】.
2. The color of【Start】is inverted and countdown of reaction time starts.
3. Pour the solution to the Cell and put the Cell in the cell box.
4. After the reaction time has elapsed, the result is displayed.
5. The result will be saved automatically. (When a memory card is inserted)
6. The result will be printed out automatically. (When a printer is connected)

- Before zero adjustment,【Start】is disabled.
- At 30 seconds before the reaction time ends, the buzzer issues a bleep as a reminder to set the cell.
- After measurement, the color inversion of【Start】returns to the original color.
- After measurement,【Start】is disabled. Perform the steps from zero adjustment.
- During measurement, it is not possible to turn off the power supply.
- Even when a memory card is inserted, automatic saving may not be executed if it is locked or the data in it have reached the upper limit.

Performing manual measurement

1. Press【Read】.
2. A result is displayed.
3. The result will be saved automatically. (When a memory card is inserted)
4. The result will be printed out automatically. (When a printer is connected)

- Manual measurement is enabled after zero adjustment, during measurement and after measurement finished.
- Even when a memory card is inserted, automatic saving may not be executed if it is locked or the data in it have reached the upper limit.

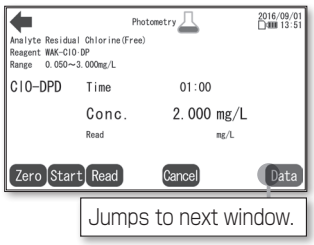
Canceling measurement

1. Press【Cancel】.
2. The instrument state returns to the state as of before zero adjustment.

- After zero adjustment,【Cancel】is enabled.
- During measurement, measurement is canceled. The stopped measurement cannot be resumed.
- If【Cancel】is pressed during and after measurement, the result are deleted from the window.
- To turn off the power during measurement, first press【Cancel】.

Viewing data

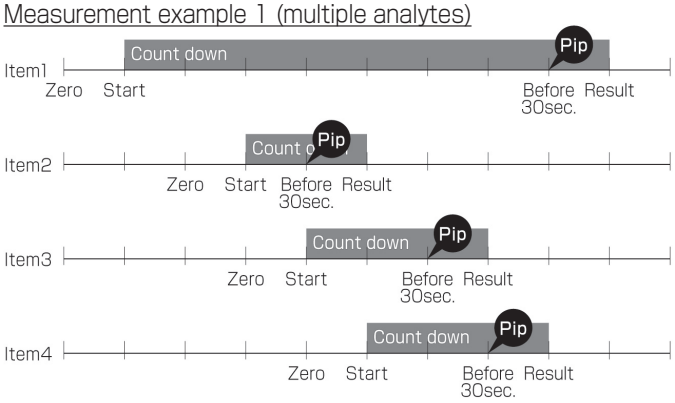
1. Press【Data】.
2. [Photometry Data Window] is displayed.
3. It is possible to view the past results stored in the memory card.



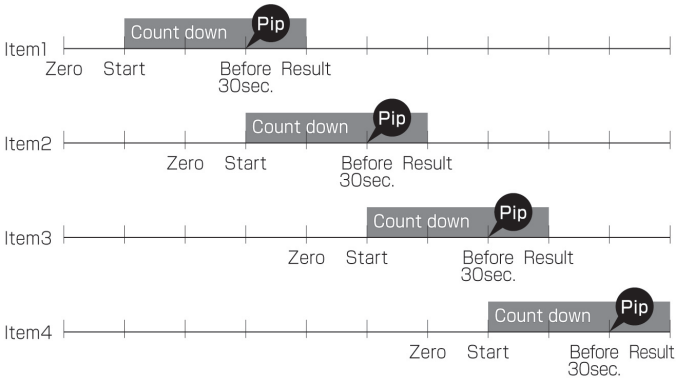
Photometry (parallel measurement of four samples)

Measurement for multiple analytes or measurement of multiple samples for the same analyte can be performed in parallel.
It is possible to set items 1 to 4.

Measurement example 1 (multiple analytes)

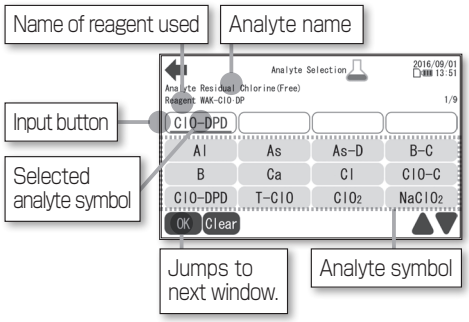


Measurement example 2 (multiple samples for the same analyte)



Selecting analyte

1. Press 【Photometry】 on [Main Window].
2. [Analyte Selection Window] is displayed.
3. Press an input button.
4. Press the desired analyte symbol.
5. The analyte name and the name of reagent used are displayed, and the analyte symbol is displayed in an input button. (Selection of item 1 has finished.)
6. Press a different input button from that in Step 3. The cursor moves.
7. If you press a analyte symbol, a analyte name and the name of reagent used are displayed, and the corresponding analyte symbol is displayed in an input button. (Selection of item 2 has finished.)
8. To set item 3 and item 4, repeat the steps 6 to 7.
9. Pressing 【OK】 brings you to [Photometry Window].

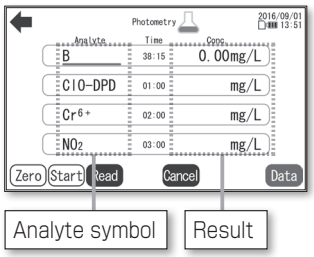


Canceling analyte

1. Press an input button on which the desired analyte symbol is displayed.
2. Pressing 【Clear】 clears the contents of the input button and the analyte is canceled.

[Item1] Performing zero adjustment and measurement

1. Fill the Cell with the sample.
2. Put the Cell in the cell box.
3. Press 【Zero】.
4. When the zero adjustment finishes, the color of 【Zero】 is inverted. "0" is displayed in the result display area for item 1.
5. After zero adjustment, mix the sample with the reagent. At the same time, press 【Start】.
6. The color of 【Start】 is inverted and countdown of reaction time starts.
7. Pour the solution to the Cell.



Point - Inversion of 【Zero】 and 【Start】 indicates the state of the selected analyte.

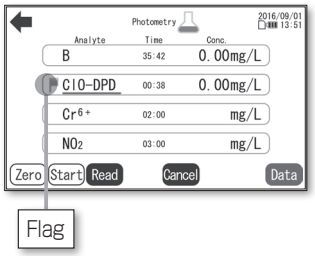
[Item2] Performing zero adjustment and measurement

1. Fill the Cell with the sample.
2. Press the desired analyte symbol for item 2.
3. The inverted state of【Zero】and【Start】returns to the original state.
4. Put the Cell in the cell box.
5. Press【Zero】.
6. Mix the sample with the reagent. At the same time, press【Start】.
7. Pour the solution to the Cell.

- Repeat the same steps for item 3 and item 4.

Finishing measurement

1. A flag is displayed on the analyte whose reaction time finishes most early.
2. Put the Cell for the analyte indicated with the flag in the cell box.
3. After the reaction time has elapsed, the result is displayed in black in the result display area.
4. The result will be saved automatically.
5. The result will be printed out automatically.
6. A flag is displayed on the analyte whose reaction time finishes next.
7. Repeat steps 2 to 6.



Performing manual measurement

1. Press a analyte symbol for which you want to perform manual measurement.
2. Press【Read】.
3. A result is displayed in **red**. ＊ is displayed at the right end.
4. The result will be saved automatically.
5. The result will be printed out automatically.

Canceling measurement

1. Press a analyte symbol whose measurement you want to cancel.
2. Press【Cancel】.
3. Only for the selected analyte, the state returns to that of before zero adjustment.

- Only for the selected analyte,【Cancel】is enabled.
- After zero adjustment,【Cancel】is enabled.
- During measurement, measurement is stopped. The stopped measurement cannot be resumed.
- If【Cancel】is pressed during and after measurement, the result are deleted from the window.
- To turn off the power during measurement, first cancel the ongoing measurement.

Viewing data

1. Press【Data】.
2. [Photometry Data Window] is displayed.
3. It is possible to view the past results stored in the memory card.

- During countdown of reaction time,【Data】is disabled.

8. Measurement Methods

Al Aluminum

Color development: Yellow → Orange → Red
Method : ECR
Range : 0.05 — 0.40 mg/L (ppm)
Reagent : LR-Al No.24 R-1 (Liquid) , R-2 (Pack)
Reaction time : 5 minutes after R-2 reagent is added.

Cell : PACKTEST Square Cup
Wavelength : 533 nm, 560 nm

Procedure

1. Press【Al】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 1.5 mL (up to line) and fill the Round Cell with the sample for 25 mL (up to white line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. Discard the sample in the Cell. (Fig.2)
5. Add 2 mL of R-1 reagent into the Round Cell using the supplied pipette, tightly attach the cap, and shake the Round Cell 5 to 6 times. (Fig.3)
6. Add the R-2 reagent, press【Start】, tightly attach the cap, and intensely shake the Round Cell for approx. 10 seconds. (Fig.4)
7. Within 5 minutes, pour the solution in the Round Cell for 1.5 mL into the Cell that has gone through zero adjustment (up to line) and put the Cell in the cell box. (Fig.5)
8. After 5 minutes have elapsed, the concentration will be automatically displayed.

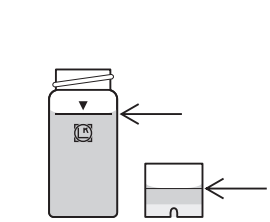


Fig.1

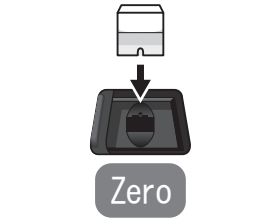


Fig.2

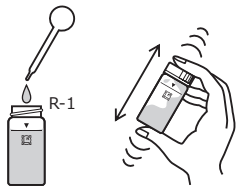


Fig.3

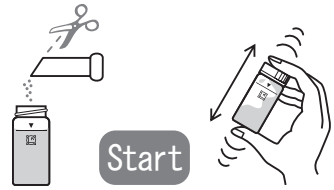


Fig.4

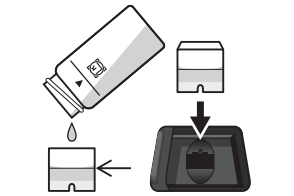


Fig.5

Caution

1. In this method, the concentration of ionized aluminum (Al^{3+}) in the sample is measured. If result of Aluminum concentration including suspension and precipitate is required, dissolve Aluminum in advance and then perform measurement.
2. The dissolved state of aluminum greatly varies depending on the pH of the sample, and aluminum could exist in the form of suspended solid or precipitate. Perform measurement after pretreatment according to the measurement purpose.
3. The optimum pH during color development is 6.If this pH cannot be achieved, neutralize the sample as necessary. A sample with a small buffering capacity can be measured even if its pH is around 2.
4. Perform measurement with the sample temperature set to 15 to 30℃.
5. Use of a measuring pipette or the like instead of the supplied pipette enables more accurate measurement.

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

It is not possible to measure seawater.

Except for Heavy metal ions:

≤ 100mg/L,: B (Ⅲ) , Ca^{2+} , Cl^- , I^- , K^+ , Mg^{2+} , Na^+ , NH_4^+ , NO_2^- , NO_3^- , SO_4^{2-} , Anionic Surfactant , Phenol , Residual Chlorine
≤ 10mg/L,: PO_4^{3-}
< 1mg/L,: F^-

Heavy metal ions:

≤ 10mg/L,: Ba^{2+} , CN^- , Co^{2+} , Cu^{2+} , Fe^{2+} , Fe^{3+} , Mn^{2+} , Mo (Ⅵ) , Ni^{2+} , Zn^{2+}
≤ 1mg/L,: Cr^{3+}
< 1mg/L,: Cr (Ⅵ)

As Arsenic

Color development: None → Light blue → Blue
Method : Molybdenum Blue
Range : 0.20 — 3.00 mg/L (ppm)
Reagent : DPR-As R-1 (Liquid) , R-2 (Liquid) , R-3 (Liquid) , R-4 (Liquid) , Tube
Reaction time : 5 minutes after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 650 nm

Features

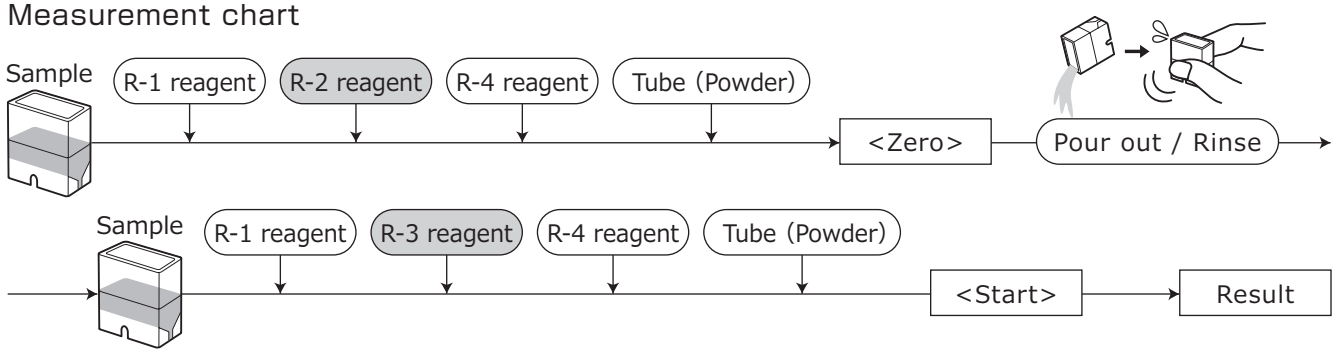
In the Molybdenum-blue absorptiometry method, which is the color development principle of this product, the colors of arsenate ions (As(Ⅴ)) and phosphate ions (PO_4^{3-}) develop in the same manner.

If arsenate ions, arsenite ions (As(Ⅲ)) and phosphate ions exist in the sample, first reduce the arsenate ions into arsenite ions and develop the color of phosphate ions only, and use this color as a reference. (the upper row of "Measurement chart" below)
Next, oxidize the arsenite ions into arsenate ions and develop their color together with the original arsenate ions and phosphate ions. (The lower row of "Measurement chart" below)
The total value of arsenate ions and arsenite ions is obtained through subtraction between these two color developments, and it is converted into an arsenic value.

Caution

If phosphate ions coexist at a concentration of 1 mg/L or higher, it is not possible to measure the concentration of arsenate ions.

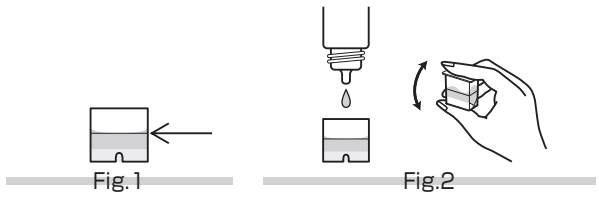
Measurement chart

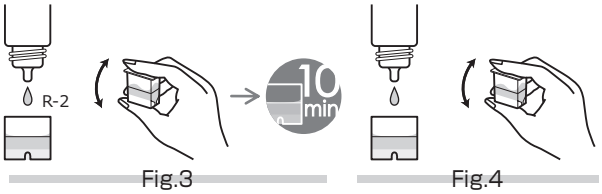


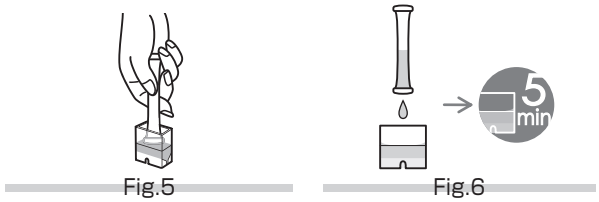
Procedure

First, develop the color of phosphate ions only for the purpose of zero adjustment.

1. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.1)
2. Add one droplet of R-1 reagent, attach the cap, and shake the Cell 2 to 3 times. (Fig.2)
3. Add two droplets of R-2 reagent, attach the cap, shake the Cell 2 to 3 times, and leave for 10 minutes. (Fig.3)
4. Add four droplets of R-4 reagent, attach the cap, and shake the Cell 2 to 3 times. (Fig.4)
5. Suck the whole amount of the sample in the Cell into the tube and then lightly shake the tube 5 to 6 times. (Fig.5)
6. Return the solution to the Cell and wait for 5 minutes. (Fig.6)







7. Press【As】.

8. Press【OK】to switch to the photometry window.

9. Put the Cell in which only the color of phosphate has been developed in the cell box, and press【Zero】. (Fig.7)

10. Take the Cell out of the cell box, empty it, and clean the Cell and cap with pure water. (Fig.8)

Next, develop the colors of phosphate ions, arsenate ions and arsenite ions, and obtain a result.

11. Fill the Cell in Step 10 with the sample for 1.5 mL (up to line). (Fig.9)

12. Add one droplet of R-1 reagent and one droplet of R-3 reagent, attach the cap, and shake the Cell 2 to 3 times. (Fig.10)

13. Add four droplets of R-4 reagent, attach the cap, and shake the Cell 2 to 3 times. (Fig.11)

14. Suck the whole amount of the sample in the Cell into the tube and press【Start】at the same time. (Fig.12)

15. Lightly shake the tube in Step 14 from 5 to 6 times, return the solution in the tube to the Cell in a gentle manner, set it again in the cell box. (Fig.13)

16. After 5 minutes have elapsed, the concentration will be automatically displayed.

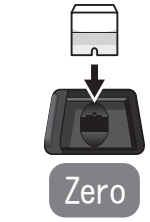


Fig.7

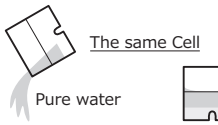


Fig.8

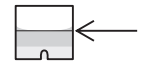


Fig.9

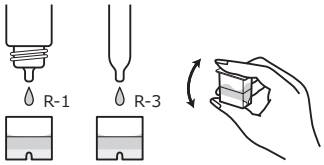


Fig.10

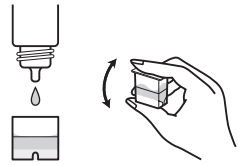


Fig.11

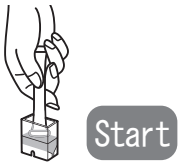


Fig.12

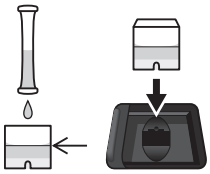


Fig.13

Caution

1. In this method, it is possible to measure the concentration of arsenate ions (As (Ⅴ)) and arsenite ions (As (Ⅲ)) in the sample, and not possible to measure the concentration of arsenic in other forms.
2. The optimum pH during color development is 2. If the pH of the sample is not within the range from 2 to 9, neutralize the sample with dilute sulfuric acid or dilute sodium hydroxide solution, etc.
3. It is not possible to perform measurement of a sample containing arsenate ions at a concentration of 10 mg/L or higher or a sample in a highly oxidized state.

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

Oxidizing substance or reductive substance may affect the measurement.
It is not possible to measure seawater.

≦ 1000mg/L,: B (Ⅲ) , Cl^- , CN^- , K^+ , Na^+ , NH_4^+ , SO_4^{2-} , Zn^{2+}
≦ 500mg/L,: Ca^{2+} , Mg^{2+} , NO_3^-
≦ 200mg/L,: NO_2^-
≦ 100mg/L,: Cr^{3+} , Ni^{2+} , Silica
≦ 50mg/L,: Al^{3+} , Co^{2+} , F^- , I^- , Mn^{2+} , Mo (Ⅵ) , Phenol
≦ 10mg/L,: Fe^{2+} , Fe^{3+}
≦ 5mg/L,: Cr (Ⅵ)
≦ 1mg/L,: PO_4^{3-} , Residual Chlorine
< 1mg/L,: Ba^{2+} , Cu^{2+}

As-D　Arsenic (Low Range)

Color development : None → Light blue → Blue
Method : Separation with a syringe filter / Molybdenum Blue
Range : 0.009 — 0.200 mg/L(ppm)
Reagent : SPK-As(D)　K-1 (Liquid) , K-2 (Liquid) , K-3 (Liquid) , K-4 (Liquid) , Tube
Reaction time : 5 minutes after drawing sample into the tube.
Preparation Procedure : Read the instruction for the reagent (SPK-As(D)).

Cell : PACKTEST Square Cup
Wavelength : 640 nm

Procedure

1. Press【As-D】.
2. Press 【OK】 to switch to the photometry window.
3. Perform procedures of "Collection" in the instruction supplied with the reagent (SPK-As(D)).
4. Press the treated filter onto the syringe firmly, and connect the nozzle. (Fig.1)
5. Fill the Cell with K-3 Reagent for 1.5 mL (up to line). (Fig.2)
6. Put the Cell in the cell box and press 【Zero】. (Fig.3)
7. Add four droplets of K-4 Reagent to the Cell. (Fig.4)
8. Draw the solution slowly from the Cell into the syringe, as much as possible. Press out the solution **slowly** to the Cell.
   Repeat this step twice. (Fig.5)
9. Press out the solution completely to the Cell. (Fig.6)
10. Suck the whole amount of the solution in the Cell into the tube and press 【Start】 at the same time. (Fig.7)
11. Invert the tube lightly end to end for 30 times to mix with reagent. (Fig.8)
12. Return the solution back into the Cell slowly, and set the Cell into the cell box. (Fig.9)
13. After 5 minutes have elapsed, the concentration will be automatically displayed.

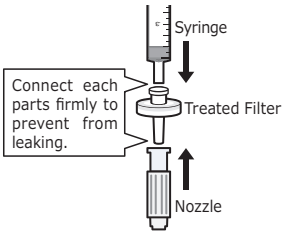


Fig.1

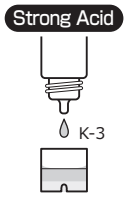


Fig.2

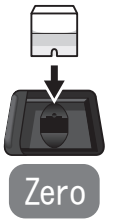


Fig.3

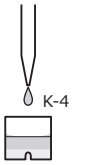


Fig.4

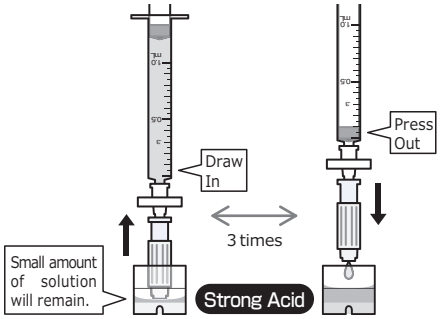


Fig.5

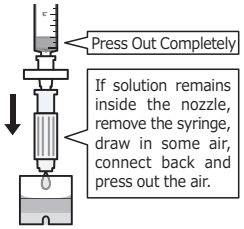


Fig.6

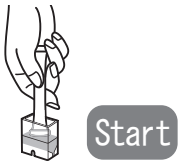


Fig.7

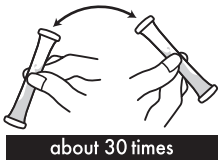


Fig.8

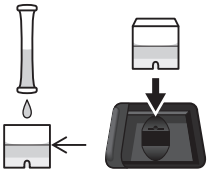


Fig.9

Caution

1. Refer to the instruction for the reagent (SPK-As(D)).
2. Perform measurement with the solution temperature set to 15 to 30℃ .

Influence of coexisting substance

Refer to the instruction for the reagent (SPK-As(D)).

B-C　Boron (High Range)

Color development : Light yellow → Yellow
Method　　: Azomethine H
Range　　: 5.0 — 80.0 mg/L (ppm)
Reagent　　: WAK-B (C)　K-1 (Liquid) , Tube
Reaction time : 12 minutes after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 490 nm

Procedure

1. Press【B-C】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 0.2 mL by using the small pipette. (Fig.1)
4. Add the K-1 reagent for 1.5 mL to the sample in the Cell by using the large pipette, attach the cap, and shake the Cell 2 to 3 times. (Fig.2)
5. Remove the cap of the Cell, set the Cell in the cell box and press【Zero】. (Fig.3)
6. Suck the whole amount of the sample in the Cell into the tube and press【Start】at the same time. (Fig.4)
7. Shake the tube in Step 6 by overturning it to right and left for 60 times in 1 minute. (Fig.5)
8. Return the solution in the tube to the Cell in a gentle manner, set it again in the cell box. (Fig.6)
9. After 12 minutes have elapsed, the concentration will be automatically displayed.

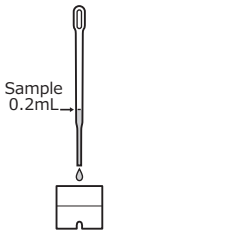


Fig.1

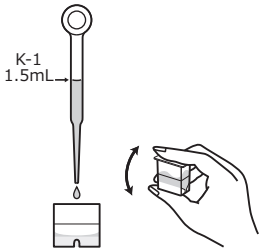


Fig.2

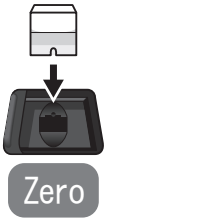


Fig.3

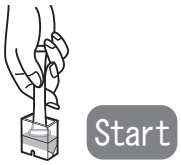


Fig.4

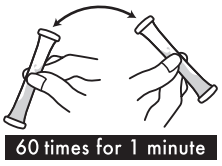


Fig.5

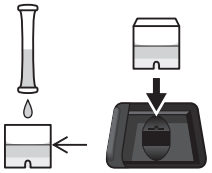


Fig.6

Caution

1. In this method, the concentration of ionized borate (borax) is measured and it is converted into a boron concentration value. It is impossible to measure the concentration of fluoroborate (BF_4^-).
2. Use the small pipette for sample after thoroughly cleaning it with pure water or cleaning its inside with the sample.
3. The optimum pH during color development is 6. If the pH of the sample is not within the range from 5 to 9, neutralize the sample with dilute sulfuric acid or dilute sodium hydroxide solution, etc.
4. Perform measurement with the sample temperature set to 20℃ .
   If the sample temperature is other than 20℃ , multiplying the measurement value by either of the following coefficients can implement correction.
   15℃・・・×0.95　　25℃・・・×1.20
5. Use of a measuring pipette or the like instead of the supplied pipette enables more accurate measurement.

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

Seawater does not affect the measurement. (However, ordinary seawater contains boron at 4 to 5 mg/L.)

≤ 5000mg/L,: As (Ⅲ) , Cl^- , F^- , I^- , K^+ , Na^+ , NH_4^+ , NO_2^- , NO_3^- , PO_4^{3-} , Phenol
≤ 2500mg/L,: Mg^{2+} , Mn^{2+}
≤ 1000mg/L,: Ni^{2+} , SO_4^{2-} , Zn^{2+}
≤ 500mg/L,: Ba^{2+} , Ca^{2+}
≤ 250mg/L,: Al^{3+} , Cr^{3+} , Anionic Surfactant
≤ 100mg/L,: Cu^{2+}
≤ 50mg/L,: CN^- , Cr (Ⅵ) , Residual Chlorine
≤ 25mg/L,: Fe^{2+} , Sn^{2+}
< 1mg/L,: Ag^+ , Fe^{3+}

B　Boron

Color development: Light yellow → Yellow
Method　　: Azomethine H
Range　　: 0.50 — 6.00 mg/L (ppm)
Reagent　　: WAK-B　Tube
Reaction time : 40 minutes after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 490 nm

Procedure

1. Press【B】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Suck the whole amount of the sample in the Cell into the tube and press【Start】at the same time. (Fig.3)
6. Shake the tube in Step 5 about 10 times. (If large orange lumps are left in the tube, further shake the tube.) (Fig.4)
7. Gently return the solution in the tube to the Cell, set it again in the cell box. (Fig.5)
8. After 40 minutes have elapsed, the concentration will be automatically displayed.

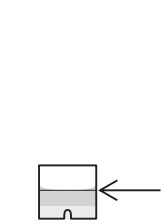


Fig.1

Fig.2

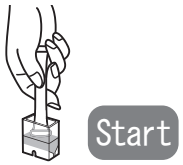


Fig.3

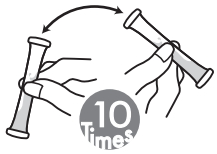


Fig.4

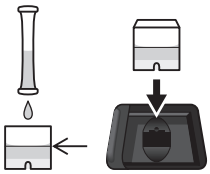


Fig.5

Caution

1. In this method, the concentration of ionized borate (borax) is measured and it is converted into a boron concentration value. It is impossible to measure the concentration of fluoroborate (BF_4^-).
2. The optimum pH during color development is 6. If the pH of the sample is not within the range from 5 to 9, neutralize the sample with dilute sulfuric acid or dilute sodium hydroxide solution, etc.
3. Perform measurement with the sample temperature set to 20℃ .
   If the sample temperature is other than 20℃ , multiplying the measurement value by either of the following coefficients can implement correction.
   15℃・・・×0.95　　25℃・・・×1.25

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

Seawater does not affect the measurement. (However, ordinary seawater contains boron at 4 to 5 mg/L.)

≦ 1000mg/L,: As (Ⅲ) , Cl^- , F^- , I^- , K^+ , Na^+ , NH_4^+ , NO_2^- , NO_3^- , PO_4^{3-} , Phenol
≦ 500mg/L,: Mg^{2+} , Mn^{2+}
≦ 250mg/L,: Ni^{2+} , SO_4^{2-} , Zn^{2+}
≦ 100mg/L,: Ba^{2+} , Ca^{2+}
≦ 50mg/L,: Al^{3+} , Cr^{3+} , Anionic Surfactant
≦ 25mg/L,: Cu^{2+}
≦ 10mg/L,: CN^- , Cr (Ⅵ) , Residual Chlorine
≦ 5mg/L,: Fe^{2+} , Sn^{2+}
< 1mg/L,: Ag^+ , Fe^{3+}

Cd　Cadmium

Color development : Yellow → Orange → Pink
Method : Separation with a syringe filter / 5-Br-PAPS
Range : 0.003 — 0.035 mg/L(ppm)
Reagent : SPK-Cd　K-1 (Liquid) , K-2 (Liquid) , K-3 (Liquid) , K-4 (Liquid) , Tube
Reaction time : 1 minute after drawing sample into the tube.
Preparation Procedure : Read the instruction for the reagent (SPK-Cd).

Cell : PACKTEST Square Cup
Wavelength : 554 nm

Procedure

1. Press【Cd】.
2. Press 【OK】 to switch to the photometry window.
3. Perform procedures of "Washing" in the instruction supplied with the reagent (SPK-Cd).
4. Press the treated filter onto the syringe firmly, and connect the nozzle. (Fig.1)
5. Fill the Cell with K-4 Reagent for 1.5 mL (up to line). (Fig.2)
6. Put the Cell in the cell box and press 【Zero】. (Fig.3)
7. Draw the solution slowly from the Cell into the syringe, as much as possible. Press out the solution **slowly** to the Cell.
   Repeat this step 4 times. (Fig.4)
8. Press out the solution completely to the Cell. (Fig.5)
9. Suck the whole amount of the solution in the Cell into the tube and press 【Start】 at the same time. (Fig.6)
10. Shake the tube in Step 9 about 30 times to dissolve the reagent in the tube completely. (Fig.7)
11. Return the solution back into the Cell slowly, and set the Cell into the cell box. (Fig.8)
12. After 1 minute has elapsed, the concentration will be automatically displayed.

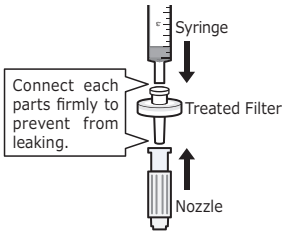


Fig.1

Fig.2

Fig.3

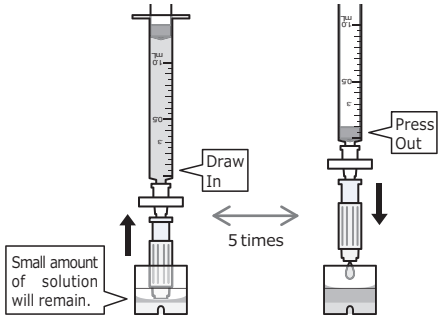


Fig.4

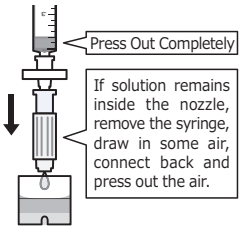


Fig.5

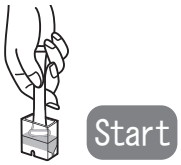


Fig.6

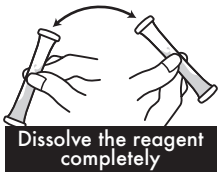


Fig.7

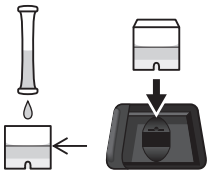


Fig.8

Caution

1. Refer to the instruction for the reagent (SPK-Cd).
2. Perform measurement with the solution temperature set to 15 to 30℃ .

Influence of coexisting substance

Refer to the instruction for the reagent (SPK-Cd).

Cl-500　Chloride (High Range)

Color development: Transparent → White Turbidity
Method　　: Dilution and Turbidimetry with Silver Nitrate
Range　　: 20 — 500 mg/L(ppm)
Reagent　　: DPR-Cl　R-1 (Dropper) , R-2 (Dropper)
Reaction time : 3 minutes after R-2 reagent is added.

Cell : PACKTEST Square Cup
Wavelength : 615 nm

Procedure

1. Press【Cl-500】.
2. Press【OK】to switch to the photometry window.
3. Suck about 0.2mL of air into the supplied syringe, suck the sample in succession, and adjust the liquid level to the scale mark of 0.12mL. (Fig.1)
4. Pour the sample in the syringe into the Cell. (Fig.2)
5. Add pure water up to line of the Cell by using supplied pipette. (Fig.3)
6. Put the Cell in the cell box and press【Zero】. (Fig.4)
7. Add one droplet of the R-1 reagent, attach the cap, and shake the Cell 2 to 3 times. (Fig.5)
8. Add one droplet of the R-2 reagent, immediately attach the cap, and shake the Cell 2 to 3 times, and press【Start】. (Fig.6)
9. Remove the cap of the Cell, set the Cell in the cell box again. (Fig.7)
10. After 3 minutes have elapsed, the concentration will be automatically displayed.

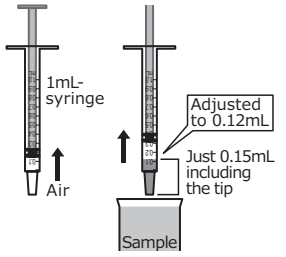


Fig.1

Fig.2

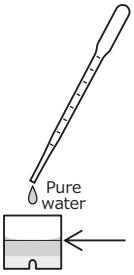


Fig.3

Fig.4

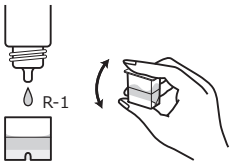


Fig.5

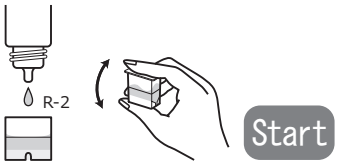


Fig.6

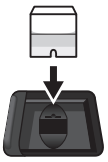


Fig.7

Caution

1. Refer to "Cl　Chloride".
2. In Step 5 of "Procedure", pure water is required. (Do not use tap water.)
3. Use of a measuring pipette or the like instead of the supplied syringe enables more accurate measurement.

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

≤ 10000mg/L,: Al^{3+} , B (Ⅲ) , Ca^{2+} , Co^{2+} , Cr^{3+} , Cu^{2+} , F^- , Fe^{3+} , K^+ , Mg^{2+} , Mn^{2+} , Na^+ , NH_4^+ , Ni^{2+} , NO_2^- , NO_3^- , SO_4^{2-} , Zn^{2+} , Phenol
≤ 5000mg/L,: Silica
≤ 2000mg/L,: PO_4^{3-} , Anionic Surfactant
≤ 100mg/L,: Fe^{2+}
≤ 50mg/L,: Residual Chlorine
≤ 10mg/L,: Ba^{2+} , Cr (Ⅵ) , I^- , Mo (Ⅵ)
< 1mg/L,: CN^-

Cl Chloride

Color development: Transparent → White Turbidity
Method : Turbidimetry with Silver Nitrate
Range : 2.0 – 50.0 mg/L(ppm)
Reagent : DPR-Cl R-1 (Dropper) , R-2 (Dropper)
Reaction time : 3 minutes after R-2 reagent is added.

Cell : PACKTEST Square Cup
Wavelength : 615 nm

Procedure

1. Press【Cl】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Add one droplet of the R-1 reagent, attach the cap, and shake the Cell 2 to 3 times. (Fig.3)
6. Add one droplet of the R-2 reagent, immediately attach the cap, and shake the Cell 2 to 3 times, and press【Start】. (Fig.4)
7. Remove the cap of the Cell, set the Cell in the cell box again. (Fig.5)
8. After 3 minutes have elapsed, the concentration will be automatically displayed.

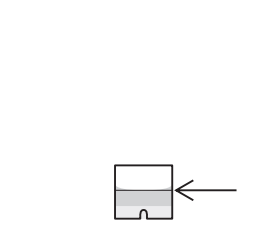


Fig.1 Fig.2

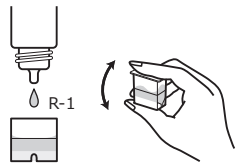


Fig.3

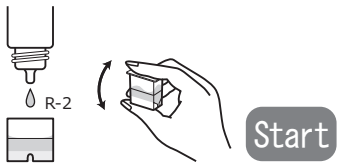


Fig.4

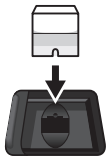


Fig.5

Caution

1. In this method, the concentration of chloride ions (Cl^-) in the sample is measured. If Br^- and I^- coexist, a positive measurement error could occur.
2. The chloride to be measured is not such chlorine for disinfection as contained in tap water or the like. To measure the concentration of chlorine for disinfection, refer to "ClO-DPD Residual Chlorine (Free)".
3. The optimum pH during color development is 9 or less. To an alkaline sample, add dilute sulfuric acid or the like so as to adjust the pH of the sample to 9 or less. (Do not use hydrochloric acid.)
4. Perform measurement with the sample temperature set to 20 to 25℃.
   If the sample temperature is not within the range, multiplying the measurement value by either of the following coefficients can implement correction.
   15℃・・・×1.3 30℃・・・×0.84
5. Depending on the operation method, the results vary. In Step 6 of "Procedure", shake the Cell as soon as possible after R-2 reagent is added.
6. To set the Cell in the box, remove the cap. Wipe off water droplets before setting the Cell in the cell box.
7. As turbid substances attach to the Cell after measurement, thoroughly clean the Cell.

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

It is possible to measure seawater, but as it has a high concentration of chloride ions, dilution is necessary. (Approximately 1000 times in the case of artificial seawater)

≤ 1000mg/L,: Al^{3+}, B (Ⅲ), Ca^{2+}, Co^{2+}, Cr^{3+}, Cu^{2+}, F^-, Fe^{3+}, K^+, Mg^{2+}, Mn^{2+}, Na^+, NH_4^+, Ni^{2+}, NO_2^-, NO_3^-, SO_4^{2-}, Zn^{2+}, Phenol
≤ 500mg/L,: Silica
≤ 200mg/L,: PO_4^{3-}, Anionic Surfactant
≤ 10mg/L,: Fe^{2+}
≤ 5mg/L,: Residual Chlorine
≤ 1mg/L,: Ba^{2+}, Cr (Ⅵ), I^-, Mo (Ⅵ)
< 1mg/L,: CN^-

ClO-C　Residual Chlorine (High Range)

Color development: None → Yellow → Orange → Red brown
Method　　: Potassium Iodide
Range　　: 2 — 500 mg/L(ppm)
Reagent　　: WAK-ClO (C)　Tube
Reaction time : 1 minute after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 470 nm, 600 nm

Procedure

1. Press【ClO-C】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Suck the whole amount of the sample in the Cell into the tube and press【Start】at the same time. (Fig.3)
6. Lightly shake the tube in Step 5 from 5 to 6 times, return the solution in the tube to the Cell in a gentle manner, set it again in the cell box. (Fig.4)
7. After 1 minute has elapsed, the concentration will be automatically displayed.

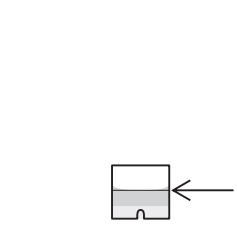


Fig.1

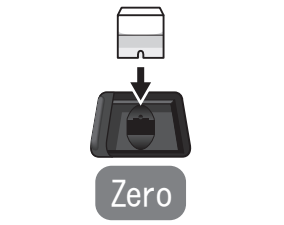


Fig.2

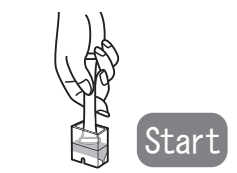


Fig.3

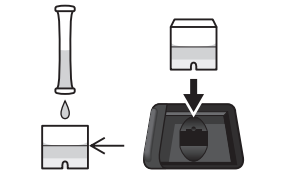


Fig.4

Caution

1. In this method, the concentration of the total residual chlorine (free residual chlorine + combined residual chlorine) is measured.
2. This residual chlorine is chlorine for disinfection. To measure the concentration of chloride ions (Cl^-) such as common salt, refer to "Cl　Chloride".
3. The optimum pH during color development is 4. If the pH of the sample is not within the range from 3 to 9, neutralize the sample with dilute sulfuric acid or dilute sodium hydroxide solution, etc.
4. Perform measurement with the sample temperature set to 15 to 30℃.

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

Seawater does not affect the measurement.
Reductive substances such as Fe^{2+} and NO_2^- consume residual chlorine.
NO_2^- may serve as an oxidizer and may cause a positive measurement error.
Oxidizing substances such as hydrogen peroxide cause a positive measurement error.

≤ 1000mg/L,: Al^{3+}, B (Ⅲ), Ca^{2+}, Cl^-, F^-, K^+, Mg^{2+}, Mn^{2+}, Mo (Ⅵ), Na^+, NH_4^+, Ni^{2+}, NO_3^-, PO_4^{3-}, SO_4^{2-}, Zn^{2+}
≤ 200mg/L,: Ba^{2+}
≤ 50mg/L,: Cr (Ⅵ), Anionic Surfactant, Phenol
≤ 20mg/L,: Cr^{3+}
≤ 5mg/L,: Fe^{3+}
≤ 2mg/L,: Cu^{2+}

ClO-DPD　Residual Chlorine (Free)

Color development: None → Pink
Method　　: N,N-diethyl-*p*-phenylenediamine sulfate
Range　　: 0.05 — 3.00 mg/L(ppm)
Reagent　　: WAK-ClO･DP　Tube
Reaction time : 1 minute after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 552 nm, 532 nm, 670 nm

Procedure

1. Press【ClO-DPD】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Suck the whole amount of the sample in the Cell into the tube and press【Start】at the same time. (Fig.3)
6. Lightly shake the tube in Step 5 from 5 to 6 times, immediately return the solution in the tube to the Cell in a gentle manner, set it again in the cell box. (Fig.4)
7. After 1 minute has elapsed, the concentration will be automatically displayed.

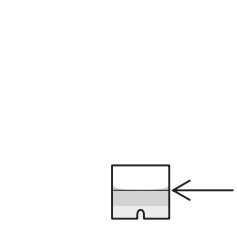


Fig.1

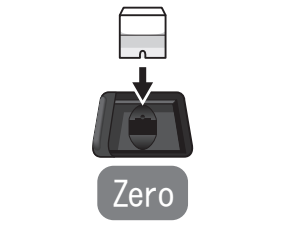


Fig.2

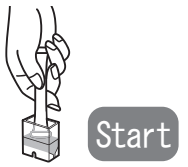


Fig.3

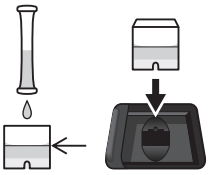


Fig.4

Caution

1. In this method, the concentration of free residual chlorine in the sample is measured.
   To measure the concentration of the total residual chlorine (= free residual chlorine + combined residual chlorine), refer to "T-ClO　Total Residual Chlorine".
2. This residual chlorine is chlorine for disinfection. To measure the concentration of chloride ions (Cl^-) such as common salt, refer to "Cl　Chloride".
3. The optimum pH during color development is 7. If the pH of the sample is not within the range from 5 to 9, neutralize the sample with dilute sulfuric acid or dilute sodium hydroxide solution, etc.
4. Perform measurement with the sample temperature set to 15 to 30℃.
5. When the concentration of residual chlorine is 500 mg/L or higher, the measurement value will be low. If high concentration is anticipated, dilute in advance and then perform measurement.

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

Seawater does not affect the measurement.
Reductive substances such as CN^-, Fe^{2+} and NO_2^- consume residual chlorine.
Oxidizing substances cause a positive measurement error.
As NH_4^+ reacts with free residual chlorine to turn into combined residual chlorine, the amount of free residual chlorine reduces.
(The total residual chlorine remains the same.)
If I^- coexists, combined residual chlorine will also be measured.

≦ 1000mg/L,: Ca^{2+}, Cl^-, F^-, K^+, Mo (Ⅵ), Na^+, Ni^{2+}, PO_4^{3-}, SO_4^{2-}, Zn^{2+}
≦ 500mg/L,: Al^{3+}, B (Ⅲ), Cr^{3+}, Mg^{2+}
≦ 250mg/L,: Mn^{2+}
≦ 100mg/L,: NO_3^-, Phenol
≦ 25mg/L,: Co^{2+}
≦ 10mg/L,: Fe^{3+}
≦ 5mg/L,: Ba^{2+}
≦ 1mg/L,: Cu^{2+}
< 1mg/L,: Ag^+, Cr (Ⅵ)

T-ClO　Total Residual Chlorine

Color development : None → Pink
Method : N,N-diethyl-*p*-phenylenediamine sulfate
Range : 0.05 — 3.00 mg/L(ppm)
Reagent : WAK-T·ClO　Tube
Reaction time : 2 minutes after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 552 nm, 532 nm, 670 nm

Procedure

1. Press【T-ClO】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Suck the whole amount of the sample in the Cell into the tube and press【Start】at the same time. (Fig.3)
6. Lightly shake the tube in Step 5 from 5 to 6 times, immediately return the solution in the tube to the Cell in a gentle manner, set it again in the cell box. (Fig.4)
7. After 2 minutes have elapsed, the concentration will be automatically displayed.

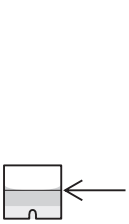


Fig.1

Fig.2

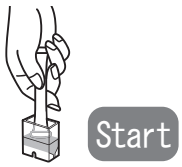


Fig.3

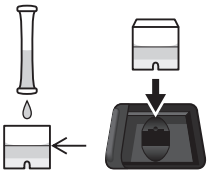


Fig.4

Caution

1. In this method, the concentration of total residual chlorine in the sample is measured.
   To measure the concentration of free residual chlorine (= total residual chlorine - combined residual chlorine), refer to "ClO-DPD Residual Chlorine (Free)".
2. Total residual chlorine is chlorine for disinfection. To measure the concentration of chloride ions (Cl^-) such as common salt, refer to "Cl　Chloride".
3. The optimum pH during color development is 7. If the pH of the sample is not within the range from 5 to 9, neutralize the sample with dilute sulfuric acid or dilute sodium hydroxide solution, etc.
4. Perform measurement with the sample temperature set to 15 to 30℃.
5. When the concentration of residual chlorine is 500 mg/L or higher, the measurement value will be low. If high concentration is anticipated, dilute in advance and then perform measurement.

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

Seawater does not affect the measurement.
Reductive substances such as CN^-, Fe^{2+} and NO_2^- consume residual chlorine.
Oxidizing substances cause a positive measurement error.

≤ 1000mg/L,: Ca^{2+}, Cl^-, F^-, I^-, K^+, Mo (Ⅵ), Na^+, Ni^{2+}, PO_4^{3-}, SO_4^{2-}, Zn^{2+}
≤ 500mg/L,: Al^{3+}, B (Ⅲ), Cr^{3+}, Mg^{2+}
≤ 250mg/L,: Mn^{2+}
≤ 100mg/L,: NO_3^-, Phenol
≤ 25mg/L,: Co^{2+}
≤ 10mg/L,: Fe^{3+}
≤ 5mg/L,: Ba^{2+}
≤ 1mg/L,: Cu^{2+}
< 1mg/L,: Ag^+, Cr (Ⅵ)

ClO_2 Chlorine Dioxide

Color development: None → Pink
Method : N,N-diethyl-*p*-phenylenediamine sulfate with Glycine
Range : 0.20 — 6.00 mg/L(ppm)
Reagent : WAK-ClO_2 K-1 (Dropper) , Tube
Reaction time : 30 seconds after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 552 nm, 532 nm, 670 nm

Procedure

1. Press【ClO_2】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Add two droplets of K-1 reagent, attach the cap, and shake the Cell 2 to 3 times. (Fig.3)
6. Suck the whole amount of the sample in the Cell into the tube and press【Start】at the same time. (Fig.4)
7. Lightly shake the tube in Step 6 from 5 to 6 times, immediately return the solution in the tube to the Cell in a gentle manner, set it again in the cell box. (Fig.5)
8. After 30 seconds have elapsed, the concentration will be automatically displayed.

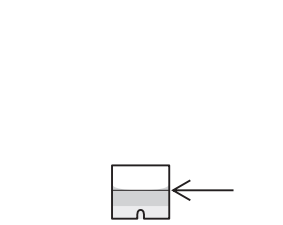


Fig.1

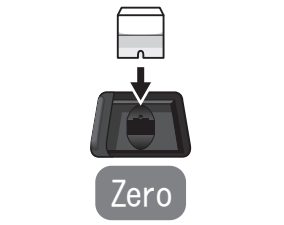


Fig.2

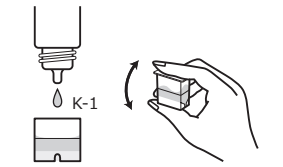


Fig.3

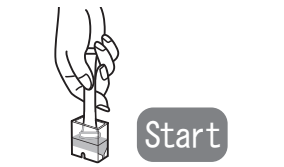


Fig.4

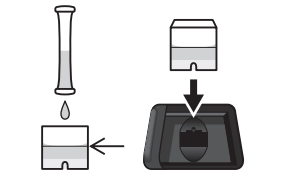


Fig.5

Caution

1. Strictly observe the reaction time. After the reaction time has elapsed, the color development will be intensified. In particular, in the case where residual chlorine, chlorite ions, chlorate ions, etc. are considered to coexist, be sure to strictly observe the reaction time.
2. The optimum pH during color development is 7. If the pH of the sample is not within the range from 5 to 9, neutralize the sample with dilute sulfuric acid or dilute sodium hydroxide solution, etc.
3. Perform measurement with the sample temperature set to 15 to 30℃ .
4. When the concentration of chlorine dioxide is 200 mg/L or higher, the measurement value will be low. If high concentration is anticipated, dilute in advance and then perform measurement.

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

Seawater does not affect the measurement.
Reductive substances such as CN^-, Fe^{2+}, and NO_2^- consume chlorine dioxide. Oxidizing substances cause a positive measurement error.
If I^- coexists, residual chlorine will also be measured.

≤ 1000mg/L,: B (Ⅲ) , Ca^{2+} , Cl^- , Cr^{3+} , F^- , I^- , K^+ , Mg^{2+} , Mn^{2+} , Na^+ , Ni^{2+} , NO_3^- , PO_4^{3-} , SO_4^{2-} , Zn^{2+}
≤ 500mg/L,: Al^{3+} , Chlorite ion , Chlorate ion
≤ 250mg/L,: NH_4^+
≤ 50mg/L,: Mo (Ⅵ)
≤ 25mg/L,: Co^{2+}
≤ 10mg/L,: Fe^{3+} , Phenol
≤ 5mg/L,: Ba^{2+}
≤ 1mg/L,: Cu^{2+} , Residual Chlorine
< 1mg/L,: Ag^+ , Cr (Ⅵ) , Fe^{2+} , NO_2^-

$NaClO_2$ Sodium Chlorite

Color development: None → Yellow → Orange → Red brown
Method : Potassium Iodide
Range : 2 — 500 mg/L(ppm)
Reagent : WAK-$NaClO_2$ K-1 (Dropper) , Tube
Reaction time : 1 minute after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 470 nm, 600 nm

Procedure

1. Press【$NaClO_2$】
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Add four droplets of K-1 reagent. (Fig.3)
6. Immediately suck the whole amount of the sample in the Cell into the tube and press【Start】at the same time. (Fig.4)
7. Lightly shake the tube in Step 6 from 5 to 6 times, return the solution in the tube to the Cell in a gentle manner, set it again in the cell box. (Fig.5)
8. After 1 minute has elapsed, the concentration will be automatically displayed.

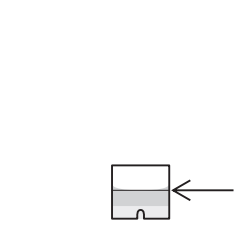


Fig.1

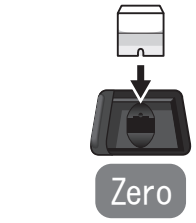


Fig.2

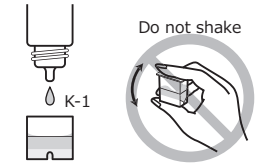


Fig.3

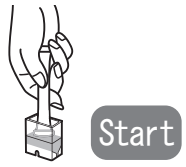


Fig.4

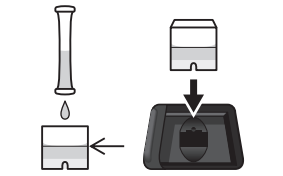


Fig.5

Caution

1. In this method, the concentration of residual chlorine and chlorine dioxide is also measured.
2. As chlorine gas may be generated during measurement, be sure to perform measurement while ventilating the air.
3. The optimum pH during color development is 1. Neutralize a sample of pH 10 or greater with dilute sulfuric acid.
4. Perform measurement with the sample temperature set to 15 to 30℃ .
5. After the K-1 reagent is added in Step 5 of "Procedure", do not shake the Cell, but immediately suck the sample into the tube. If the Cell is shaken or it takes time before the sample is sucked, the result may become low.

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

Seawater and tap water do not affect the measurement.
The residual chlorine and chlorine dioxide also make color development and cause possitive error. Oxidizing substances such as hydrogen peroxide cause a positive measurement error.
Reductive substances such as Fe^{2+} and NO_2^- consume sodium chlorite. NO_2^- may serve as an oxidizer and may cause a positive measurement error.
When the sample contains starch, the color may develop to brown to black, disabling measurement.

≤ 1000mg/L,: Al^{3+} , B (Ⅲ) , Ca^{2+} , F^- , I^- , K^+ , Mg^{2+} , Mn^{2+} , Mo (Ⅵ) , Na^+ , NH_4^+ , Ni^{2+} , NO_3^- , PO_4^{3-} , SO_4^{2-} , Zn^{2+} , Amino acid , Glucose , Phenol , Silica , Sodium Chlorate
≤ 100mg/L,: Anionic Surfactant
≤ 20mg/L,: Albumin
≤ 10mg/L,: Ba^{2+} , Starch
≤ 5mg/L,: Cu^{2+} , Fe^{3+}
≤ 1mg/L,: Fe^{2+} , Residual Chlorine
< 1mg/L,: Cr (Ⅵ)

$NaClO_2$-D　Sodium Chlorite (Low Range)

Color development : None → Pink
Method : Potassium iodide and DPD method
Range : 0.10 — 2.00 mg/L (ppm)
Reagent : WAK-$NaClO_2$ (D) , K-1 (Small Pack) , K-2 (Dropper) , K-3 (Dropper) , Tube
Reaction time : 1 minute after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 552 nm, 532 nm, 670 nm

Procedure

1. Press【$NaClO_2$-D】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Add the K-1 reagent. (Fig.3)
6. Add one droplet of K-2 reagent, attach the cap, and shake the Cell 10 times. (Fig.4)
7. Add two droplets of K-3 reagent. (Fig.5)
8. Suck the whole amount of the sample in the Cell into the tube and press【Start】at the same time. (Fig.6)
9. Lightly shake the tube in Step 8 from 5 to 6 times, immediately return the solution in the tube to the Cell in a gentle manner, set it again in the cell box. (Fig.7)
10. After 1 minute has elapsed, the concentration will be automatically displayed.

Fig.2

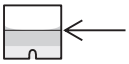


Fig.1

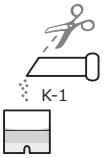


Fig.3

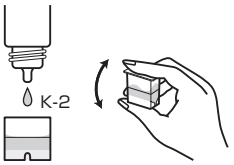


Fig.4

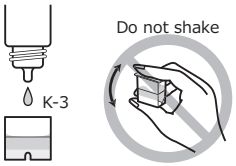


Fig.5

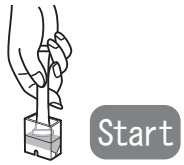


Fig.6

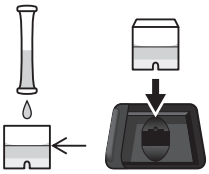


Fig.7

When separately measuring the concentration of sodium chlorite and residual chlorine (0.5 mg/L or less)

① Press【$NaClO_2$-D】.
② Press【OK】to switch to the photometry window.
③ Fill the Cell with the sample for 1.5 mL (up to line). (Fig.8)
④ Suck the whole amount of the sample in the Cell into the tube of PACKTEST Total Residual Chlorine (WAK-T·ClO) and then lightly shake the tube 5 to 6 times.
Develop the color of the total residual chlorine. (At this point, the color of the sodium chlorite will not be developed.)(Fig.9)
⑤ Return the solution in the tube to the Cell, put the Cell in the cell box, and press【Zero】. (Fig.10)
⑥ Take the Cell out of the cell box, empty it, and clean it with pure water or the sample. (Fig.11)
⑦ Fill the Cell in ⑥ with the sample for 1.5 mL (up to line). (Fig.12)
⑧ From this step onwards, perform measurement by following in Step 5 of "Procedure".

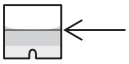


Fig.8


Fig.9

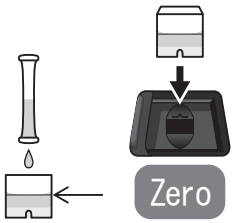


Fig.10

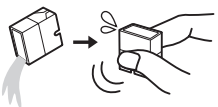


Fig.11

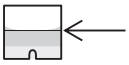


Fig.12

Caution

1. In this method, the concentration of residual chlorine (hypochlorous acid, etc.) and chlorine dioxide is also measured.
   To separately measure the concentration of sodium chlorite and residual chlorine, refer to "When separately measuring the concentration of sodium chlorite and residual chlorine (0.5 mg/L or less)." In this case, separately prepare the PACKTEST Total Residual Chlorine (WAK-T·ClO). However, this cannot be applied in the case where residual chlorine of 0.5 mg/L or more coexists.
2. As chlorine gas may be generated during measurement, be sure to perform measurement while ventilating the air.
3. The pH as of after adding K-2 reagent is approx. 1. The pH as of during color development is approx. 5. If the pH of the sample is not within the range from 2 to 9, perform measurement after neutralizing the sample with dilute sulfuric acid or dilute sodium hydroxide solution, etc. However, extract by 9 mmol/L sodium carbonate solution can be measured without pH adjustment.
4. Perform measurement with the sample temperature set to 15 to 30℃ .

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

Seawater does not affect the measurement.
The color is developed by the residual chlorine contained in the tap water. The residual chlorine and chlorine dioxide also make the same color development.
The color is also developed by oxidizing substances such as hydrogen peroxide.
Reductive substances such as Fe^{2+} and NO_2^- consume sodium chlorite. NO_2^- may serve as an oxidizer and may develop its color.

≤ 1000mg/L,	: Al^{3+} , B (Ⅲ) , Ca^{2+} , Cl^- , F^- , I^- , K^+ , Mg^{2+} , Mn^{2+} , Mo (Ⅵ) , Na^+ , NH_4^+ , Ni^{2+} , NO_3^- , PO_4^{3-} , SO_4^{2-} , Zn^{2+} , Albumin , Sodium Chlorate , Citric Acid , Glycine , Glucose , Glutamic Acid , Tartaric Acid , Silica , Starch , Phenol
≤ 500mg/L,	: Co^{2+}
≤ 50mg/L,	: Anionic Surfactant
≤ 10mg/L,	: Fe^{3+}
≤ 2mg/L,	: Cu^{2+} , Cationic Surfactant
< 1mg/L,	: Cr (Ⅵ) , Fe^{2+} , NO_2^- , SO_3^{2-} , Ascorbic Acid , Residual Chlorine , Hydrogen Peroxide , Chlorine Dioxide

CN-2　Free Cyanide

Color development: None → (Red) → Blue
Method　　: 4-Pyridinecarboxylic Acid
Range　　: 0.01 — 1.00 mg/L(ppm)
Reagent　　: WAK-CN-2　K-1 (Small Pack) , Tube
Reaction time : 10 minutes after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 607 nm, 535 nm, 680 nm

Procedure

1. Press【CN-2】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Add the K-1 reagent, attach the cap, and shake the Cell 5 to 6 times. (Fig.3)
6. Suck the whole amount of the sample in the Cell into the tube and press【Start】at the same time. (Fig.4)
7. Lightly shake the tube in Step 6 about 10 times. (Fig.5)
8. Immediately return the solution in the tube to the Cell in a gentle manner, set it again in the cell box. (Fig.6)
9. After 10 minutes have elapsed, the concentration will be automatically displayed.

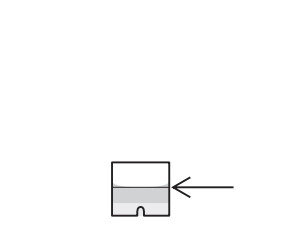


Fig.1

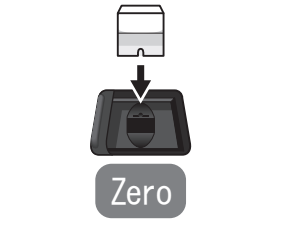


Fig.2

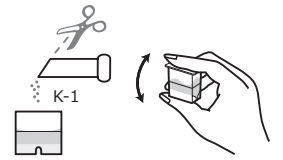


Fig.3

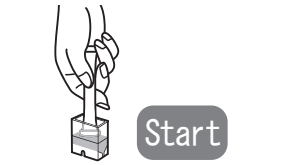


Fig.4

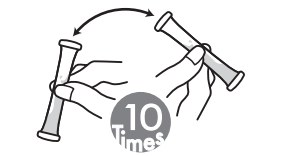


Fig.5

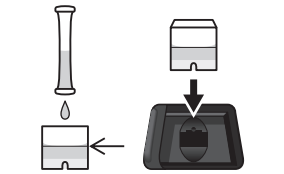


Fig.6

Caution

1. In this method, the concentration of free cyanide (mainly cyanide ions (CN^-) and cyanogen chloride (CNCl)) in the sample is measured. To measure the concentration of total cyanide including iron cyano complex, etc. refer to "CN^T-D　Total Cyanide (Low Range)" and "CN^T　Total Cyanide".
2. The optimum pH during color development is 6. If the pH of the sample is not within the range from 5 to 12, neutralize the sample with dilute sulfuric acid or dilute sodium hydroxide solution, etc.
3. After the tube is shaken in Step 7 of "Procedure", immediately and gently return the solution in the tube to the Cell. If you shake the tube excessively or take time before returning the solution, turbid may be generated.
4. Perform measurement with the sample temperature set to 20 to 30℃ .

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

So far, only some thiocyanogens and ethylene amines (tetraethylenepentamine and pentaethylene hexamine) are erroneously detected.
If a strong oxidizing substance such as residual chlorine or a reductive substance such as sulfite exists, a negative error occurs.
It is not possible to measure seawater.
If the sample is industrial wastewater or the like that contains interfering substance, conduct pretreatment by distillation/ ventilation method or others.

≤ 1000mg/L,: As (Ⅲ) , B (Ⅲ) , Cl^- , F^- , K^+ , Mg^{2+} , Mo (Ⅵ) , Na^+ , NH_4^+ , NO_3^- , PO_4^{3-} , SO_4^{2-} , EDTA , Phenol
≤ 200mg/L,: NO_2^- , Zn^{2+}
≤ 100mg/L,: Ca^{2+} , Ascorbic Acid , Anionic Surfactant , Silica
≤ 50mg/L,: Al^{3+} , Cr^{3+} , Cr (Ⅵ)
≤ 20mg/L,: Cu^{2+}
≤ 10mg/L,: Ba^{2+} , Fe^{2+} , Fe^{3+}
≤ 5mg/L,: Residual Chlorine
≤ 1mg/L,: Formaldehyde
< 1mg/L,: Co^{2+} , I^- , Mn^{2+} , Ni^{2+} , SCN^- , SO_3^{2-} , some kinds of ethylene amine , Cationic Surfactant

CN^T Total Cyanide

Color development: Yellow → Orange → Brown
Method : Distillation and Picric acid
Range : 0.1 — 3.0 mg/L(ppm)
Reagent : LR-CN^T No.46 R-1 (Powder), R-2 (Pack)
Reaction time : 0 minute
Other Items to Use : Water Analysis Set: Total Cyanide (Model: WA-CN^T or WA-CN^T-2)
Preparation Procedure : Read the instruction for "Water Analysis Set: Total Cyanide".

Cell : PACKTEST Square Cup
Wavelength : 540 nm

Procedure

1. Press【CN^T】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with pure water for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Take out the Cell, discard the pure water, and pour 1.5 mL of the solution that has been adjusted to 25 mL through distillation and color development with the Water Analysis Set: Total Cyanide to the same Cell. (Fig.3)
6. Set the Cell in the cell box again and press【Start】. (Fig.4)
7. The concentration will be automatically displayed.

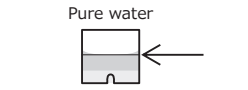


Fig.1

Fig.2

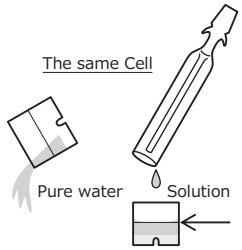


Fig.3

Fig.4

Caution

1. As the glass portion of the distiller becomes hot during distillation, be careful not to get burned.
2. If you use dilute sulfuric acid instead of R-1 reagent, be sure to put a boiling stone in the flask to avoid bumping in it.
3. Sufficiently ventilate the room during distillation.

Influence of coexisting substance

Refer to the instruction for "Water Analysis Set: Total Cyanide."

CN^T-D　Total Cyanide (Low Range)

Color development: None → (Red) → Blue
Method　　: Distillation and 4-Pyridinecarboxylic Acid - Pyrazolone
Range　　: 0.005 — 0.150 mg/L(ppm)
Reagent　　: LR-CN-B　No.14B　R-1 (Small Pack), R-2 (Pack)
Reaction time : 20 minutes after R-2 reagent is added.
Other Items to Use : Water Analysis Set: Total Cyanide (Low Range) (Model: WA-CN^T(L))
Preparation Procedure : Read the instruction for pretreatment reagent (CN^T-RA).

Cell : PACKTEST Square Cup
Wavelength : 638 nm, 590 nm

Procedure

1. Press【CN^T-D】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with pure water for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
   Discard the pure water in the Cell.
5. Add the R-1 reagent to the Round Cell containing the solution as explained in the instruction for pretreatment reagent (CN^T-RA). (Fig.3)
6. Tightly attach the cap, shake the Round Cell about 10 times, and wait for 3 minutes. (Fig.4)
7. Add the R-2 reagent to the Round Cell, press【Start】, tightly attach the cap, and immediately shake the Round Cell strongly more than 60 times in 30 seconds. (Fig.5)
8. Within 20 minutes, pour the solution in the Round Cell for 1.5 mL into the Cell that has gone through zero adjustment (up to line) and put the Cell in the cell box. (Fig.6)
9. After 20 minutes have elapsed, the concentration will be automatically displayed.

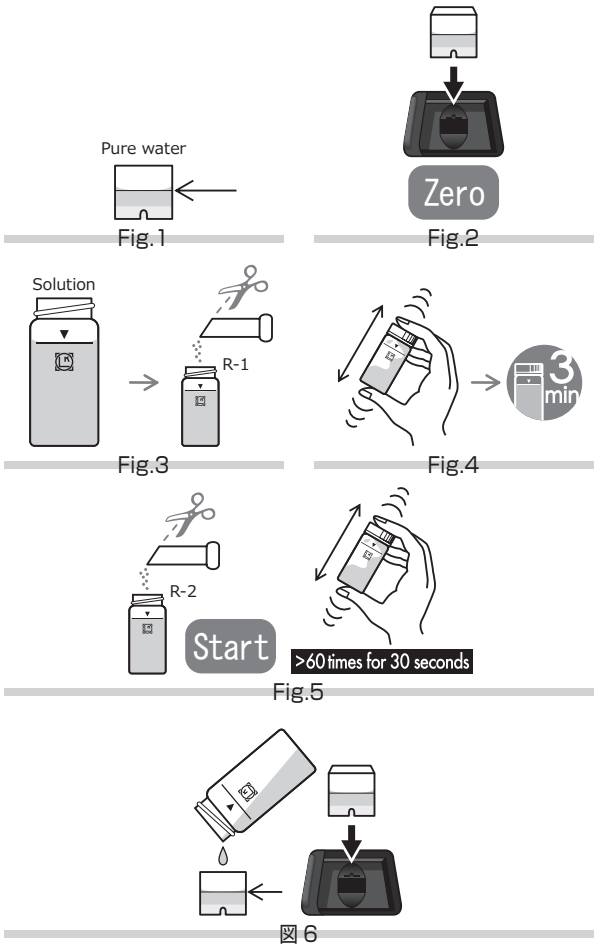


図 6

CAUTION

1. Perform measurement with the solution temperature set to 15 to 30℃ .
2. As the R-2 reagent dissolves only partially, after shaking the Round Cell in Step 6.

COD　COD with $KMnO_4$

Color development: Red purple → Green
Method　　: Oxidation by potassium permanganate in alkaline
Range　　: 2.0 — 10.0 mg/L(ppm)
Reagent　　: LR-COD-B-2　No.44　R-1（Liquid）, R-2（Liquid）, Neutralizer（Dropper）
Reaction time : 10 minutes after R-2 reagent is added.

Cell：PACKTEST Square Cup
Wavelength：525 nm

Procedure

1. Press【COD】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 1.5 mL (up to line) and fill the Round Cell with the sample for 25 mL (up to white line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. Discard the sample in the Cell. (Fig.2)
5. Add 0.5 mL of R-1 reagent into the Round Cell using the supplied syringe, tightly attach the cap, and stir the solution 5 to 6 times. (Fig.3)
6. Add 1mL of R-2 reagent into the Round Cell using the supplied pipette, and press【Start】. (Fig.4)
7. Tightly attach the cap and stir the solution 5 to 6 times. (Fig.5)
8. Within 10 minutes, pour 1.5 mL of the solution in the Round Cell into the Cell that has gone through zero adjustment, and put the Cell in the cell box. (At this point, clean the Cell with the solution contained in the Round Cell.)(Fig.6)
9. After 10 minutes have elapsed, the concentration will be automatically displayed.
10. Dispose of the wastewater in the Round Cell as of after measurement by adding about 8 droplets (0.5 mL) of neutralizer to it and confirming that it has become approximately neutral.

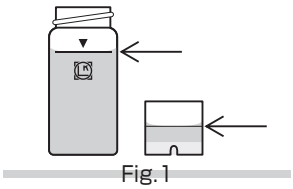


Fig.1

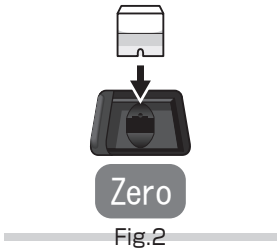


Fig.2

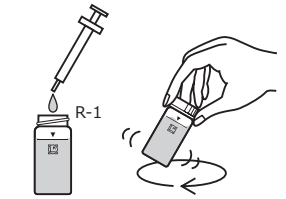


Fig.3

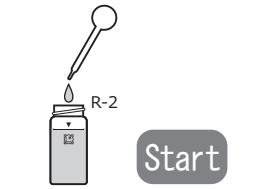


Fig.4


Fig.5

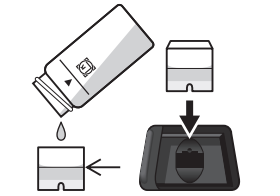


Fig.6

CAUTION

1. The optimum pH during color development is 12 or more. To an acid sample, add dilute sodium hydroxide solution or the like so as to adjust the pH of the sample to 6 or more.
2. Perform measurement with the sample temperature set to 15 to 25℃.
3. Before filling the Cell with the solution in the measurement procedure Steps 8, rinse the Cup with the solution 2 to 3 times.
4. It is not possible to measure seawater.

Positioning of this measurement method with respect to JIS method

In Japan, the potassium permanganate method (COD_{Mn}) at 100℃ for 30 minutes according to JIS K 0102 17 is commonly used for management of industrial wastewater, but the measurement method we offer applies the alkali method (COD_{OH}) according to JIS K 0102 19 and allows simple measurement in a short period of time.
In the JIS alkali method, the amount of potassium permanganate that has been consumed in a boiled water bath for 20 minutes is obtained through titration. On the other hand, the measurement method we offer obtains the amount of potassium permanganate that has been consumed at a room temperature for 10 minutes by converting the decrease of absorbance into a COD value.
Verification is conducted by using glucose reference solution, but the degree of oxidation of oxidized substance in the sample by potassium permanganate differs depending on the type and the amount of the substance.
In addition, as the reaction conditions and measurement conditions differ even between the alkali method and the acid method, the values obtained by this measurement method are only approximate values and therefore due attention needs to be paid when this method is used for measurement of industrial wastewater.
As the value obtained by this method and that obtained by JIS method may not coincide with each other, use this method after obtaining the relationship between those methods.

Color

Measurement of degree of yellow color of sample
Calibration : Pt-Co color standard solution
Range : 50 to 1000 degrees
Reaction time : 0 minute

Cell : PACKTEST Square Cup
Wavelength : 460 nm

Procedure

1. Press【Color】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with pure water for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Take out the Cell, discard the pure water, fill the same Cell with 1.5 mL of sample. (Fig.3)
6. Set the Cell in the cell box again and press【Start】. (Fig.4)
7. The result will be automatically displayed.

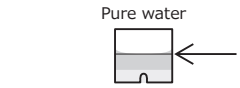


Fig.1

Fig.2

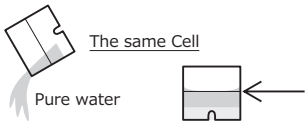


Fig.3

Fig.4

CAUTION

1. This method is applied only to substances in pale yellow to brownish yellow colors existing in a dissolved state in water or in a colloidal state, and other color and turbid interfere the measurement.

Cr^{6+} Chromium (Hexavalent)

Color development: None → Light red → Red → Red purple
Method : Diphenylcarbazide
Range : 0.05 — 1.50 mg/L(ppm)
Reagent : WAK-Cr^{6+} Tube
Reaction time : 2 minutes after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 542 nm, 580 nm, 670 nm

Procedure

1. Press【Cr^{6+}】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Suck the whole amount of the sample in the Cell into the tube and press【Start】at the same time. (Fig.3)
6. Lightly shake the tube in Step 5 from 5 to 6 times, return the solution in the tube to the Cell in a gentle manner, set it again in the cell box. (Fig.4)
7. After 2 minutes have elapsed, the concentration will be automatically displayed.

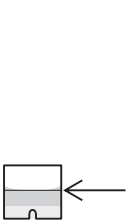


Fig.1

Fig.2

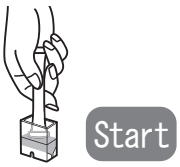


Fig.3

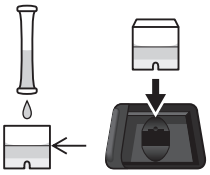


Fig.4

CAUTION

1. In this method, the concentration of hexavalent chromium (Cr^{6+}) in the sample is measured.
   To measure the concentration of the total chromium including trivalent chromium (Cr^{3+}), refer to "Cr^{T} Total Chromium".
   If a reductive substance coexists in the sample, hexavalent chromium is reduced to trivalent chromium. In this case, perform measurement of the total chromium.
2. The optimum pH during color development is 2 or less. Turn a sample of pH9 or greater to neutral or lower with dilute sulfuric acid or the like. In particular, if the sample is wastewater from fresh concrete plant or the like whose pH is high, pay special attention.
3. Perform measurement with the sample temperature set to 15 to 30℃ .

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

Seawater does not affect the measurement.
If a reductive substance coexists in the sample, hexavalent chromium is reduced to trivalent chromium. In this case, perform measurement of the total chromium.

≤ 1000mg/L,: Ba^{2+} , Ca^{2+} , Cl^{-} , CN^{-} , Co^{2+} , I^{-} , K^{+} , Mg^{2+} , Mn^{2+} , Na^{+} , NH_4^{+} , Ni^{2+} , NO_3^{-} , PO_4^{3-} , SO_4^{2-} , Zn^{2+} , Phenol
≤ 500mg/L,: Al^{3+} , F^{-}
≤ 250mg/L,: B (Ⅲ)
≤ 25mg/L,: NO_2^{-}
≤ 10mg/L,: Ag^{+}
≤ 5mg/L,: Cu^{2+} , Mo (Ⅵ)
≤ 2mg/L,: Fe^{3+}
≤ 1mg/L,: Residual Chlorine
< 1mg/L,: V (Ⅴ)

Cr^{6+}-D Chromium (Hexavalent) (Low Range)

Color development : None → Light red → Red purple
Method : Diphenylcarbazide Absorptiometry Coupled with Collecting on Membrane Filter
Range : 0.003 — 0 .100 mg/L(ppm)
Reagent : DPR—Cr^{6+}D R-1 (Pack) , R-2 (Liquid) , R-3 (Liquid)
Reaction time : 0 minute
Preparation Procedure : Read the instruction for the reagent (DPR-Cr^{6+}D).

Cell : PACKTEST Square Cup
Wavelength : 542 nm, 580 nm, 670 nm

Procedure

1. Press【Cr^{6+}-D】.
2. Press【OK】to switch to the photometry window.
3. Perform procedures ① - ⑥ of the usage for the reagent (DPR-Cr^{6+}D).
4. Fill the Cell with pure water (or tap water) so that the water level exceeds the mark line (1.5 mL). (Fig.1)
5. Put the Cell in the cell box and press【Zero】. (Fig.2)
6. Take out the Cell and completely discard the water in the Cell. If water droplets exist on the inner wall, remove them by absorbing them with tissue paper or the like. (Fig.3)
7. Suck about 0.5 mL of air into the 2.5 mL syringe, suck the R-3 reagent in succession, and adjust the liquid level to the scale mark of 1.9 mL. (Fig.4)
8. Attach the filter to the 2.5 mL syringe, and extrude the R-3 reagent one drop by one drop to collect the whole amount in the Cell. When you have extruded almost half the R-3 reagent from the syringe, pull back the pushing rod to the uppermost portion (scale mark of 2.5 mL). Then, slowly extrude the remaining R-3 reagent one drop by one drop. The collection completes when the pushing rod reaches the lowermost part and the remaining R-3 reagent has been completely extruded. (Fig.5)
9. Attach the cap of the Cell, shake the Cell 5 to 6 times while strongly holding it, and then remove the cap.(If the cap is kept attached, the solution leaks out.)(Fig.6)
10. Set the Cell in the cell box again and press【Start】. (Fig.7)
11. The concentration will be automatically displayed.

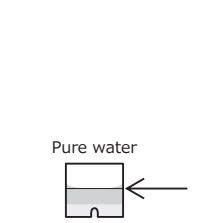


Fig.1

Fig.2

Fig.3

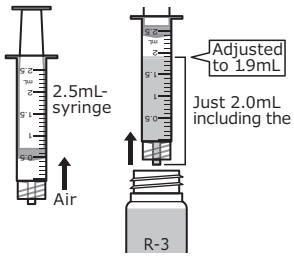


Fig.4

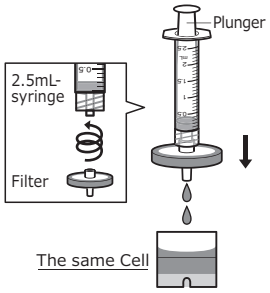


Fig.5

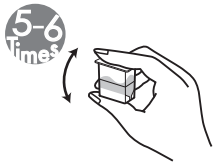


Fig.6

Fig.7

CAUTION

1. In this method, the concentration of hexavalent chromium is obtained from the absorbance of the solution that has been obtained by using the reagent (DPR-Cr^{6+}D). For notes on the operation, refer to the instruction for the reagent (DPR-Cr^{6+}D).
2. The pH of the sample as of after adding R-1 reagent is 1, that of the sample as of after adding R-2 reagent is 2, and that of the solution is 3 to 4. If the pH of the sample is not within the range from 2 to 9, neutralize the sample with dilute sulfuric acid or dilute sodium hydroxide solution, etc.
3. As the sample as of after adding reagent is strongly acidic, wear PPE during measurement and gently proceed with the operation procedures. Note that if the connection of the screw part between each syringe and filter is loose, the solution could leak out.
4. Perform measurement with the sample temperature set to 15 to 30℃ .

Influence of coexisting substance

Refer to the instruction for the reagent (DPR-Cr^{6+}D).

Cr^{T} Total Chromium

Color development: None → Light red → Red → Red purple
Method : Oxidation and Diphenylcarbazide
Range : 0.05 — 1.50 mg/L(ppm)
Reagent : Pretreatment reagent (Cr-RA) R-1 (Dropper), R-2 (Dropper), R-3 (Dropper), WAK-Cr^{6+} Tube
Other Items to Use : Beaker, Heater
Reaction time : 2 minutes after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 542 nm, 580 nm, 670 nm

Pretreatment method

Conduct pretreatment by following the procedures below.

1. Fill the beaker with 15 mL of sample, and add 5 droplets of the R-1 reagent. (Fig.1)
2. While heating the sample up to a moderately boiling state, add the R-2 reagent until pale reddish violet color remains even when the sample is stirred. (Fig.2)
3. Stop heating the sample, and add one droplet of the R-3 reagent to decolor the pale reddish violet color. If the pale reddish violet color remains, further add one droplet of R-3 reagent. (Fig.3)
   If the amount of the sample has decreased, add pure water up to 15 mL.
4. Cool down the sample in the beaker up to 15 to 30℃, fill the Cell with 1.5 mL of the sample (up to line). (Fig.4)
5. Measure it by following the "Procedure"

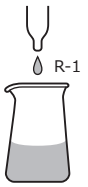


Fig.1

Fig.2

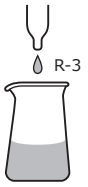


Fig.3

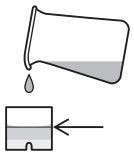


Fig.4

Procedure

1. Press 【Cr^{T}】.
2. Press 【OK】 to switch to the photometry window.
3. Put the Cell containing the sample that has gone through pretreatment in the cell box, and press 【Zero】. (Fig.5)
4. Suck the whole amount of the sample in the Cell into the tube and press 【Start】 at the same time. (Fig.6)
5. Lightly shake the tube in Step 4 from 5 to 6 times, return the solution in the tube to the Cell in a gentle manner, set it again in the cell box. (Fig.7)
6. After 2 minutes have elapsed, the concentration will be automatically displayed.

Fig.5

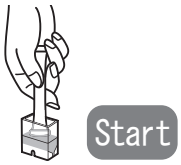


Fig.6

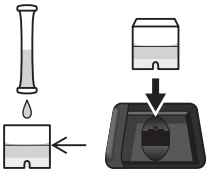


Fig.7

CAUTION

In this method, the concentration of the total chromium including trivalent chromium (Cr^{3+}) and hexavalent chromium (Cr^{6+}) is measured.

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution.
If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
For details, refer to "Cr^{6+} Chromium (Hexavalent)". (However, it is not possible to measure seawater.)

Cu　Copper

Color development: None → Light orange → Orange
Method　　: Bathocuproine
Range　　: 0.10 — 5.00 mg/L(ppm)
Reagent　　: WAK-Cu　Tube
Reaction time : 1 minute after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 482 nm, 520 nm

Procedure

1. Press【Cu】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Suck the whole amount of the sample in the Cell into the tube and press【Start】at the same time. (Fig.3)
6. Lightly shake the tube in Step 5 from 5 to 6 times, return the solution in the tube to the Cell in a gentle manner, set it again in the cell box. (Fig.4)
7. After 1 minute has elapsed, the concentration will be automatically displayed.

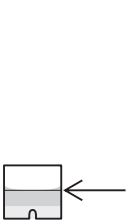


Fig.1

Fig.2

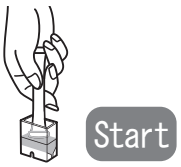


Fig.3

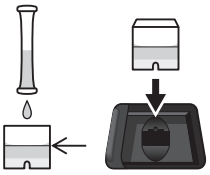


Fig.4

CAUTION

1. In this method, the concentration of ionized univalent and divalent copper (Cu^{+}, Cu^{2+}) in the sample is measured.
   If a concentration measurement value including suspension, precipitate and complex is required, dissolve the target substance in advance and then perform measurement.
2. The optimum pH during color development is 6. If the pH of the sample is not within the range from 2 to 10, neutralize the sample with dilute sulfuric acid or dilute sodium hydroxide solution, etc.
3. Perform measurement with the sample temperature set to 15 to 30℃ .

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

Seawater does not affect the measurement.
Oxidizing substance may affect the measurement.

≤ 1000mg/L,: B (Ⅲ) , Ca^{2+} , Cl^{-} , F^{-} , I^{-} , K^{+} , Mg^{2+} , Mo (Ⅵ) , Na^{+} , NH_4^{+} , Ni^{2+} , NO_2^{-} , NO_3^{-} , PO_4^{3-} , SO_3^{2-} , SO_4^{2-} , Residual Chlorine , Phenol
≤ 250mg/L,: Co^{2+} , Mn^{2+}
≤ 100mg/L,: Ba^{2+}
≤ 50mg/L,: Zn^{2+} , Anionic Surfactant
≤ 20mg/L,: Cr^{3+} , Cr (Ⅵ)
≤ 10mg/L,: Ag^{+}
≤ 5mg/L,: Fe^{2+} , Fe^{3+}
≤ 2mg/L,: Al^{3+}
≤ 1mg/L,: CN^{-}

Cu-M-2　Copper (DDTC)

Color development : None → Yellow Brown
Method : DDTC
Range : 0.5 — 10.0 mg/L(ppm)
Reagent : WAK-CuM-2　Tube
Reaction time : 2 minutes after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 451 nm, 500 nm, 550 nm

Procedure

1. Press【Cu-M-2】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Suck the whole amount of the sample in the Cell into the tube and press【Start】at the same time. (Fig.3)
6. Lightly shake the tube in Step 5 about 10 times. (Fig.4)
7. Gently return the solution in the tube to the Cell, set it again in the cell box. (Fig.5)
8. After 2 minutes have elapsed, the concentration will be automatically displayed.

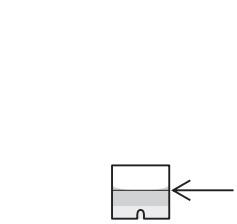


Fig.1

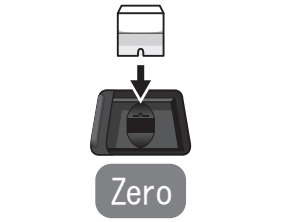


Fig.2

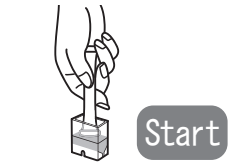


Fig.3

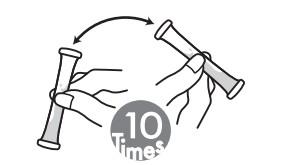


Fig.4

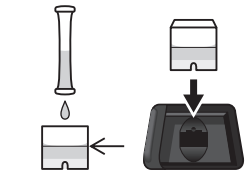


Fig.5

CAUTION

1. In this method, the concentration of ionized copper (Cu^{2+}) in the sample is measured.
2. The optimum pH during color development is 10. If the pH of the sample is not within the range from 3 to 10, neutralize the sample with dilute sulfuric acid or dilute sodium hydroxide solution, etc.
3. Perform measurement with the sample temperature set to 15 to 30℃ .

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

Seawater does not affect the measurement.
Less than 20%(w/w) of ethanol does not affect the measurement.

≤ 1000mg/L,	: Al^{3+} , B (Ⅲ) , Ba^{2+} , Br^{-} , Ca^{2+} , Cl^{-} , F^{-} , I^{-} , K^{+} , Mg^{2+} , Mn^{2+} , Mo (Ⅵ) , Na^{+} , NH_4^{+} , NO_2^{-} , NO_3^{-} , PO_4^{3-} , SO_4^{2-} , Anionic Surfactant, Non-ionic Surfactant, Glucose, Silica, Phenol
≤ 50mg/L,	: Cd^{2+} , Cr (Ⅵ) , Cationic Surfactant, Residual Chlorine
≤ 25mg/L,	: Pb^{2+} , Zn^{2+}
≤ 10mg/L,	: Cr^{3+} , Fe^{3+}
≤ 5mg/L,	: Fe^{2+} , Ni^{2+}
≤ 1mg/L,	: Co^{2+}

DET　Anionic Surfactants

Color development : None → Light blue → Blue
Method　　: Methylene Blue - Anion surfactant Complex
Range　　: 0.05 — 1.20 mg/L(ppm)
Reagent　　: WA-DET　R-1 (Dropper) , R-2 (Liquid)
Reaction time : 0 minute
Preparation Procedure : Read the instruction for the reagent (WA-DET).

Cell : PACKTEST Square Cup
Wavelength : 620 nm

Pretreatment method

1. By following the procedure Step ④ in the usage supplied with the reagent (WA-DET), add 1.5 mL of the R-2 reagent using the pipette. (The addition amount of the R-2 reagent differs from that in the case of visual colorimetry.)(Fig.1)

2. Fit the cap to the tube and intensely shake it so that the R-2 reagent spreads across the whole wall surface of the tube, and use the liquid as the solution. (Fig.2)

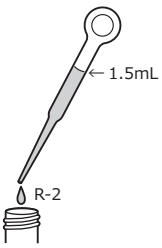


Fig.1


Fig.2

Procedure

1. Press【DET】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with pure water (or tap water) for 1.5 mL (up to line). (Fig.3)

4. Put the Cell in the cell box and press【Zero】. (Fig.4)

5. Take out the Cell, discard the pure water, and pour the whole amount of the prepared solution to the same Cell. (Fig.5)

6. Set the Cell in the cell box again and press【Start】. (Fig.6)
7. The concentration will be automatically displayed.

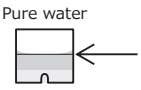


Fig.3

Fig.4

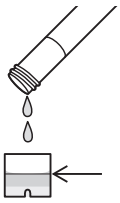


Fig.5

Fig.6

CAUTION

1. Even existence of a small amount of cationic surfactants agent, nonionic surfactants and oil can cause a negative measurement error. If these substances are considered to coexist at high concentration, dilute the sample by 10 times in advance and then perform measurement, and multiply the obtained value by 10.
   *Dilution method: Fill the tube with 2 mL of the sample, and add pure water (or tap water) up to the mark line on the tube.
   *If river water containing a non-ionic surfactants at a concentration of 1 mg/L or higher as of before adding reagent is intensely shaken, tiny bubbles will be formed on the water surface.
2. In river water, whose concentration of DET is 0.5 mg/L or higher, coexistent substances such as non-ionic surfactants are highly likely to exist, and the actual concentration of anionic surfactants may be much higher than the result.
3. The optimum pH during color development is 7. If the pH of the sample is not within the range from 3 to 9, neutralize the sample with dilute sulfuric acid or dilute sodium hydroxide solution, etc.
4. "Perform measurement with the sample temperature set to 20℃ .
   If the sample temperature is other than 20 ℃ , multiplying the measurement value by either of the following coefficients can implement correction.
   10℃・・・×0.75　　15℃・・・×0.85
   25℃・・・×1.25　　30℃・・・×1.85
5. Use of a measuring pipette or the like instead of the supplied pipette enables more accurate measurement.

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

It is not possible to measure seawater.

≤ 100mg/L,: Ca^{2+} , Cl^{-} , Cu^{2+} , F^{-} , K^{+} , Mg^{2+} , Na^{+} , NH_4^{+} , NO_2^{-} , NO_3^{-} , PO_4^{3-} , SO_4^{2-} , Residual Chlorine
≤ 10mg/L,: Fe^{2+} , Fe^{3+}

F　Fluoride (Free)

Color development : Red → Purple
Method : Lanthanum-Alizarin Complexon
Range : 0.40 — 1.50 mg/L(ppm)
Reagent : WAK-F　Tube
Reaction time : 10 minutes after drawing sample into the tube.
(Reaction time has been reduced from calibration curve data Ver. 2.02.0.)

Cell : PACKTEST Square Cup
Wavelength : 616 nm, 521 nm

Procedure

1. Press【F】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Suck the whole amount of the sample in the Cell into the tube and press【Start】at the same time. (Fig.3)
6. Shake the tube in Step 5 about 10 times. (Fig.4)
7. Gently return the solution in the tube to the Cell, set it again in the cell box.
8. After 10 minutes have elapsed, the concentration will be automatically displayed.

Fig.1

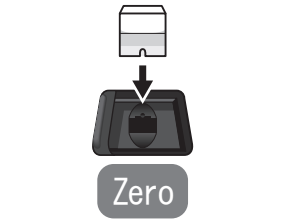


Fig.2

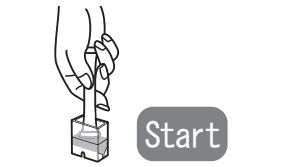


Fig.3

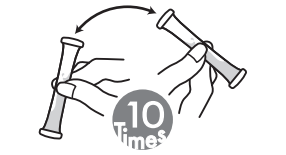


Fig.4

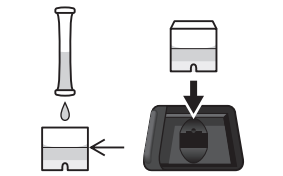


Fig.5

CAUTION

1. In this method, a sample containing small amount of coexistent substance such as distillation-separated extract and natural water is handled and the concentration of ionized fluorine (F^-) is measured.
   It is impossible to measure the concentration of fluoroborate (BF_4^-). Implement the distillation procedures in the pretreatment before total fluorine measurement according to JIS K 0102 34.1.
2. The optimum pH during color development is 5. If the pH of the sample is not within the range from 3 to 9, neutralize the sample with dilute sulfuric acid or dilute sodium hydroxide solution, etc.
3. Perform measurement with the sample temperature set to 15 to 30℃ .
4. When the concentration of fluorine ions is 100 mg/L or higher, the measurement value will be low. If high concentration is anticipated, dilute in advance and then perform measurement.

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

It is not possible to measure seawater.
Fluorine combines with metallic element such as aluminum and iron to form a fluorocomplex, and combines with alkaline earth metal such as calcium to exist in the form of suspended solid or precipitate of fluoride, which may not be measured by this method.

Except for Heavy metal ions:

≤ 100mg/L,: B (Ⅲ) , Cl^- , I^- , K^+ , Mg^{2+} , Na^+ , NH_4^+ , NO_2^- , NO_3^- , PO_4^{3-} , SO_4^{2-} ,
Anionic Surfactant , Phenol
≤ 50mg/L,: Residual Chlorine
≤ 10mg/L,: Ca^{2+}

Heavy metal ions:

≤ 10mg/L,: Ba^{2+} , CN^- , Cr^{3+} , Cr (Ⅵ) , Mn^{2+}
≤ 1mg/L,: Fe^{2+} , Fe^{3+} , Mo (Ⅵ)
< 1mg/L,: Al^{3+} , Co^{2+} , Cu^{2+} , Ni^{2+} , Zn^{2+}

Fe Iron

Color development: None → Light orange → Orange
Method : Reduction and *o*-Phenanthroline
Range : 0.10 — 5.00 mg/L(ppm)
Reagent : WAK-Fe Tube
Reaction time : 3 minutes after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 510 nm, 540 nm

Procedure

1. Press【Fe】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Suck the whole amount of the sample in the Cell into the tube and press【Start】at the same time. (Fig.3)
6. Lightly shake the tube in Step 5 from 5 to 6 times, return the solution in the tube to the Cell in a gentle manner, set it again in the cell box. (Fig.4)
7. After 3 minutes have elapsed, the concentration will be automatically displayed.

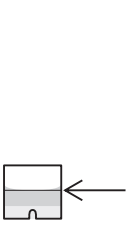


Fig.1

Fig.2

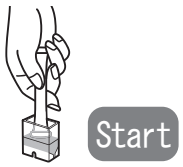


Fig.3

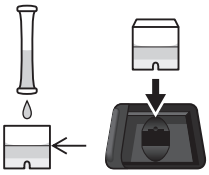


Fig.4

CAUTION

1. In this method, the concentration of ionized iron (Fe^{2+}, Fe^{3+}: dissolved iron) in the sample is measured. The dissolved state of iron greatly varies depending on the pH of the sample, and iron could exist in the form of suspended solid or precipitate. Perform measurement after pretreatment according to the measurement purpose.
2. The optimum pH during color development is 6. If this pH cannot be achieved, neutralize the sample as necessary. A sample with a small buffering capacity can be measured even if its pH is around 2.
3. To measure the concentration of the total iron in tap water or the like, you add 0.1 ～0.2 mL of 1mol/L dilute sulfuric acid to 20 mL of sample, heat the sample until it almost boils, and suck the sample into the tube after cooling it down. It is possible to measure it without neutralization.
4. The concentration of such EDTA iron as used in hydroponics can also be measured without the pretreatment.
5. Perform measurement with the sample temperature set to 15 to 30℃ .

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

Seawater does not affect the measurement.
Oxidizing substance may affect the measurement.

Except for Heavy metal ions:

≤ 10mg/L,: B (Ⅲ) , Ca^{2+} , Cl^- , F^- , I^- , K^+ , Mg^{2+} , Na^+ , NH_4^+ , NO_2^- , NO_3^- , PO_4^{3-} , SO_4^{2-} , Phenol
≤ 10mg/L,: Anionic Surfactant , Residual Chlorine

Heavy metal ions:

≤ 10mg/L,: Ba^{2+} , Co^{2+} , Cr^{3+} , Cr (Ⅵ) , Cu^{2+} , Mn^{2+} , Mo (Ⅵ) , Ni^{2+} , Zn^{2+}
≤ 1mg/L,: Al^{3+} , CN^-

Fe-D　Iron (Low Range)

Color development: None → Light red → Red
Method　　: Reduction and Bathophenatholine
Range　　: 0.05 — 2.00 mg/L(ppm)
Reagent　　: WAK-Fe (D)　Tube
Reaction time : 3 minutes after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 535 nm, 460 nm

Procedure

1. Press【Fe-D】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Suck the whole amount of the sample in the Cell into the tube and press【Start】at the same time. (Fig.3)
6. Lightly shake the tube in Step 5 from 5 to 6 times, return the solution in the tube to the Cell in a gentle manner, set it again in the cell box. (Fig.4)
7. After 3 minutes have elapsed, the concentration will be automatically displayed.

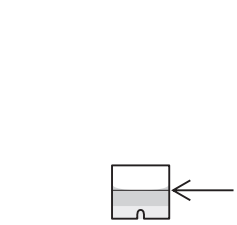


Fig.1

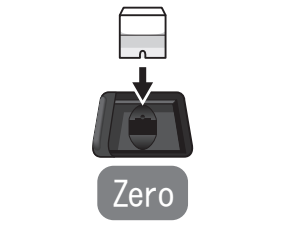


Fig.2

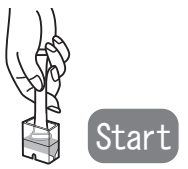


Fig.3

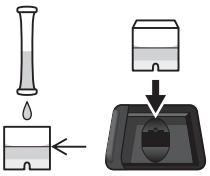


Fig.4

CAUTION

1. In this method, the concentration of ionized iron (Fe^{2+}, Fe^{3+}: dissolved iron) in the sample is measured. The dissolved state of iron greatly varies depending on the pH of the sample, and iron could exist in the form of suspended solid or precipitate. Perform measurement after pretreatment according to the measurement purpose.
2. The optimum pH during color development is 7. If this pH cannot be achieved, neutralize the sample as necessary.
   A sample with a small buffering capacity can be measured even if its pH is around 2.
3. To measure the concentration of the total iron in tap water or the like, you add 0.1 ～0.2 mL of 1mol/L dilute sulfuric acid to 20 mL of sample, heat the sample until it almost boils, and suck the sample into the tube after cooling it down. It is possible to measure it without neutralization.
4. The concentration of such EDTA iron as used in hydroponics can also be measured without the pretreatment.
5. Perform measurement with the sample temperature set to 15 to 30℃ .

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

It is not possible to measure seawater.
Oxidizing substance may affect the measurement.

≤ 500mg/L,: B (Ⅲ) , Ca^{2+} , Cl^- , F^- , I^- , K^+ , Mg^{2+} , Mn^{2+} , Na^+ , NH_4^+ , NO_3^- , SO_4^{2-}
≤ 500mg/L,: Phenol
≤ 50mg/L,: Cr (Ⅵ) , Mo (Ⅵ) , Ni^{2+} , NO_2^-
≤ 10mg/L,: Zn^{2+}
≤ 5mg/L,: PO_4^{3-}
≤ 2mg/L,: Cr^{3+} , Residual Chlorine
≤ 1mg/L,: Ba^+ , CN^-
< 1mg/L,: Al^{3+} , Co^{2+} , Cu^{2+}

Fe^{2+} Iron (Divalent)

Color development: None → Light orange → Orange
Method : *o*-Phenanthroline
Range : 0.10 — 5.00 mg/L(ppm)
Reagent : WAK-Fe^{2+} Tube
Reaction time : 3 minutes after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 510 nm, 540 nm

Procedure

1. Press【Fe^{2+}】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Suck the whole amount of the sample in the Cell into the tube and press【Start】at the same time. (Fig.3)
6. Lightly shake the tube in Step 5 from 5 to 6 times, return the solution in the tube to the Cell in a gentle manner, set it again in the cell box. (Fig.4)
7. After 3 minutes have elapsed, the concentration will be automatically displayed.

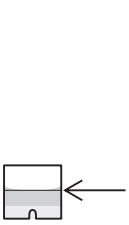


Fig.1

Fig.2

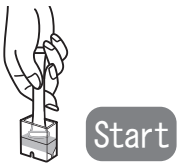


Fig.3

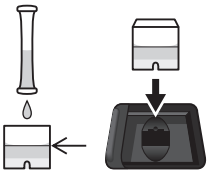


Fig.4

CAUTION

1. In this method, the concentration of ionized divalent iron (Fe^{2+}) in the sample is measured.
2. The dissolved state of iron greatly varies depending on the pH of the sample, and iron could exist in the form of suspended solid or precipitate.
   To measure the concentration of total iron in tap water or the like, refer to "Fe Iron" or "Fe-D Iron (Low Range)".
3. The optimum pH during color development is 5. If the pH of the sample is not within the range from 2 to 9, neutralize the sample with dilute sulfuric acid or dilute sodium hydroxide solution, etc.
4. Perform measurement with the sample temperature set to 15 to 30℃ .

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

Seawater does not affect the measurement.
Oxidizing substance (residual chlorine, Cr^{6+} etc.) turns Fe^{2+} into Fe^{3+}.

Except for Heavy metal ions:

≤ 100mg/L,: B (Ⅲ) , Ca^{2+} , Cl^- , F^- , I^- , K^+ , Mg^{2+} , Na^+ , NH_4^+ , NO_2^- , NO_3^- , PO_4^{3-} , SO_4^{2-} , Phenol
≤ 10mg/L,: Anionic Surfactant
< 1mg/L,: Residual Chlorine

Heavy metal ions:

≤ 10mg/L,: Al^{3+} , Ba^{2+} , Cr^{3+} , Fe^{3+} , Mn^{2+} , Mo (Ⅵ) , Ni^{2+} , Zn^{2+}
≤ 1mg/L,: CN^- , Co^{2+} , Cu^{2+}
< 1mg/L,: Cr (Ⅵ)

Fe^{2+}-D Iron (Divalent) (Low Range)

Color development: None → Light red → Red
Method : Bathophenatholine
Range : 0.05 — 2.00 mg/L(ppm)
Reagent : WAK-Fe^{2+} (D) Tube
Reaction time : 3 minutes after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 535 nm, 460 nm

Procedure

1. Press【Fe^{2+}-D】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Suck the whole amount of the sample in the Cell into the tube and press【Start】at the same time. (Fig.3)
6. Lightly shake the tube in Step 5 from 5 to 6 times, return the solution in the tube to the Cell in a gentle manner, set it again in the cell box. (Fig.4)
7. After 3 minutes have elapsed, the concentration will be automatically displayed.

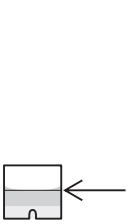


Fig.1

Fig.2

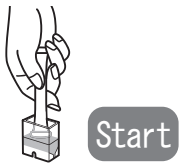


Fig.3

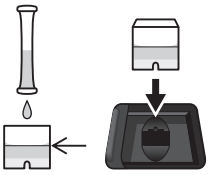


Fig.4

CAUTION

1. In this method, the concentration of ionized divalent iron (Fe^{2+}) in the sample is measured.
2. The dissolved state of iron greatly varies depending on the pH of the sample, and iron could exist in the form of suspended solid or precipitate.
   To measure the concentration of total iron in tap water or the like, refer to "Fe Iron" or "Fe-D Iron (Low Range)".
3. The optimum pH during color development is 5. If the pH of the sample is not within the range from 2 to 9, neutralize the sample with dilute sulfuric acid or dilute sodium hydroxide solution, etc.
4. Perform measurement with the sample temperature set to 15 to 30℃ .

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

It is not possible to measure seawater.
Oxidizing substance (residual chlorine, Cr^{6+} etc.) turns Fe^{2+} into Fe^{3+}.

Except for Heavy metal ions:

≤ 1000mg/L,: B (Ⅲ) , Cl^- , F^- , I^- , K^+ , Mg^{2+} , Na^+ , NH_4^+ , NO_2^- , NO_3^- , PO_4^{3-} , SO_4^{2-} , Phenol
≤ 500mg/L,: Ca^{2+}
≤ 50mg/L,: Anionic Surfactant
< 1mg/L,: Residual Chlorine

Heavy metal ions:

≤ 10mg/L,: Al^{3+} , Ba^{2+} , Cr^{3+} , Fe^{3+} , Mn^{2+} , Mo (Ⅵ) , Ni^{2+}
≤ 5mg/L,: Zn^{2+}
≤ 1mg/L,: Co^{2+} , Cu^{2+}
< 1mg/L,: CN^- , Cr (Ⅵ)

Fe^{3+} Iron (Trivalent)

Color development: None → Light red → Reddish brown
Method : Sulfosalicylic acid
Range : 1.0 — 50.0 mg/L(ppm)
Reagent : WAK-Fe^{3+} Tube
Reaction time : 1 minute after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 505 nm, 620 nm

Procedure

1. Press【Fe^{3+}】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Suck the whole amount of the sample in the Cell into the tube and press【Start】at the same time. (Fig.3)
6. Lightly shake the tube in Step 5 from 5 to 6 times, return the solution in the tube to the Cell in a gentle manner, set it again in the cell box. (Fig.4)
7. After 1 minute have elapsed, the concentration will be automatically displayed.

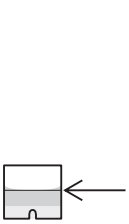


Fig.1

Fig.2

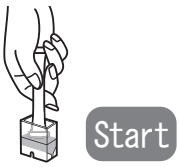


Fig.3

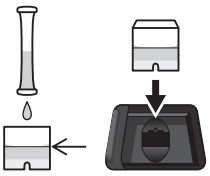


Fig.4

CAUTION

1. In this method, the concentration of ionized trivalent iron (Fe^{3+}) in the sample is measured.
2. The dissolved state of iron greatly varies depending on the pH of the sample, and iron could exist in the form of suspended solid or precipitate.
   To measure the concentration of total iron in tap water or the like, refer to "Fe Iron" or "Fe-D Iron (Low Range)".
3. The optimum pH during color development is 1. If the pH of the sample is not within the range from 1 to 9, neutralize the sample with dilute sulfuric acid or dilute sodium hydroxide solution, etc.
4. Perform measurement with the sample temperature set to 15 to 30℃ .

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

≤ 1000mg/L,: Ag^{+}, Al^{3+}, B (Ⅲ), Ba^{2+}, Ca^{2+}, Cl^{-}, Co^{2+}, Cr^{3+}, Fe^{2+}, K^{+}, Mg^{2+}, Mn^{2+}, Mo (Ⅵ), Na^{+}, NH_4^{+}, Ni^{2+}, NO_3^{-}, PO_4^{3-}, SO_4^{2-}, Zn^{2+}, Residual Chlorine, Silica , Phenol
≤ 500mg/L,: Cr (Ⅵ), Cu^{2+}, I^{-}, Anionic Surfactant
≤ 200mg/L,: NO_2^{-}, V (Ⅴ)
≤ 50mg/L,: F^{-}
≤ 10mg/L,: Cationic Surfactant
≤ 1mg/L,: CN^{-}

It is not possible to measure seawater.
A reductive substance (ascorbic acid, etc.) turns Fe^{3+} into Fe^{2+}.

FOR　Formaldehyde

Color development : Yellow → Yellow green → Green
Method : MBTH
Range : 0.20 — 1.00 mg/L(ppm)
Reagent : WAK-FOR　K-1（Small Pack）, Tube
Reaction time : 2 minutes after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 660 nm

Procedure

1. Press【FOR】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 1.5 mL (up to line).（Fig.1）
4. Put the Cell in the cell box and press【Zero】.（Fig.2）
5. Add the K-1 reagent, attach the cap, shake the Cell 5 to 6 times to dissolve the reagent, and leave the Cell for 3 minutes.（Fig.3）
6. Suck the whole amount of the sample in the Cell into the tube and press【Start】at the same time.（Fig.4）
7. Lightly shake the tube in Step 6 about 10 times.（Fig.5）
8. Gently return the solution in the tube to the Cell, set it again in the cell box.（Fig.6）
9. After 2 minutes have elapsed, the concentration will be automatically displayed.

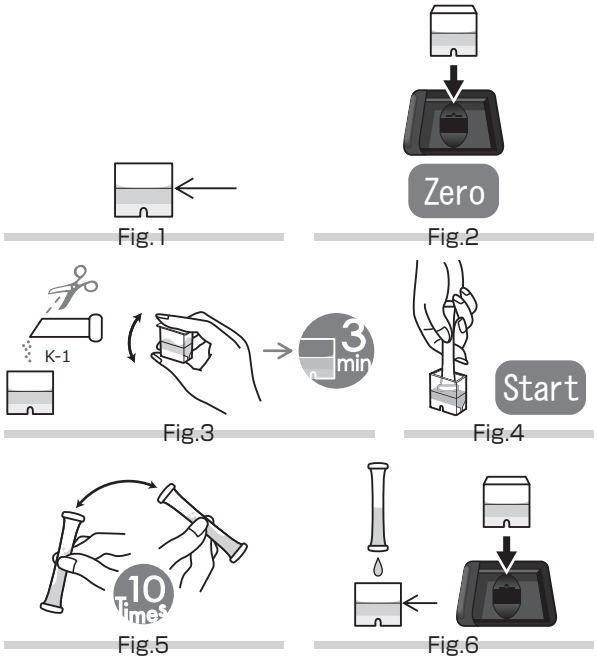


Fig.1　Fig.2　Fig.3　Fig.4　Fig.5　Fig.6

CAUTION

1. The optimum pH during color development is 3. If the pH of the sample is not within the range from 5 to 8, neutralize the sample with dilute sulfuric acid or dilute sodium hydroxide solution, etc.
2. Perform measurement with the sample temperature set to 20℃.
   If the sample temperature is other than 20 ℃, multiplying the measurement value by either of the following coefficients can implement correction.
   10℃・・・×1.30　　30℃・・・×0.60

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

It is not possible to measure seawater.
Oxidizing substance or reductive substance may affect the measurement.

Except for Heavy metal ions:

≤ 100mg/L,: B (Ⅲ), Ca^{2+}, Cl^-, F^-, K^+, Mg^{2+}, Na^+, NH_4^+, NO_3^-, PO_4^{3-}
≤ 50mg/L,: I^-, SO_4^{2-}, Phenol
≤ 20mg/L,: Anionic Surfactant, Residual Chlorine
≤ 1mg/L,: NO_2^-

Heavy metal ions:

≤ 10mg/L,: Al^{3+}, Ba^{2+}, Co^{2+}, Cu^{2+}, Fe^{2+}, Fe^{3+}, Mn^{2+}, Ni^{2+}, Zn^{2+}
≤ 5mg/L,: Cr (Ⅵ)
≤ 1mg/L,: CN^-

GLU　Glucose

Color development: Light yellow → Light purple → Purple
Method　　: 4-Aminoantipyrine with enzyme
Range　　: 0.5 — 20.0 mg/L(ppm)
Reagent　　: WAK-GLU　Tube
Reaction time : 12 minutes after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 539 nm, 610 nm

Procedure

1. Press【GLU】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Suck the whole amount of the sample in the Cell into the tube and press【Start】at the same time. (Fig.3)
6. Lightly shake the tube in Step 5 from 30 times. (Fig.4)
7. Return the solution in the tube to the Cell in a gentle manner, set it again in the cell box. (Fig.5)
8. After 12 minutes have elapsed, the concentration will be automatically displayed.

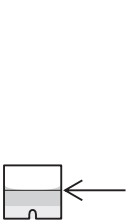


Fig.1

Fig.2

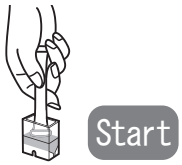


Fig.3

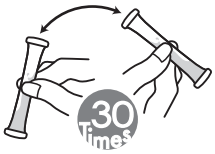


Fig.4

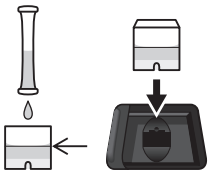


Fig.5

CAUTION

1. The optimum pH during color development is 7. If the pH of the sample is not within the range from 6 to 9, neutralize the sample with dilute sulfuric acid or dilute sodium hydroxide solution, etc.
2. Perform measurement with the sample temperature set to 20 to 30℃ .

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

It is not possible to measure seawater.
Oxidizing substances such as residual chlorine and hydrogen peroxide cause a positive error.
Reductive substances sometimes cause a negative measurement error.

≤ 1000mg/L,: B (Ⅲ) , Cl^-, F^-, I^-, K^+, Mg^{2+}, Na^+, NH_4^+, NO_3^-, PO_4^{3-}, SO_4^{2-}, Citric acid, Succinic acid, Tartaric acid, Fructose, Sucrose, Lactose
≤ 500mg/L,: Mo (Ⅵ) , NO_2^-, Zn^{2+}, Silica
≤ 200mg/L,: Mn^{2+}, Ni^{2+}, Starch
≤ 100mg/L,: Ba^{2+}, Co^{2+}, Cr^{3+}, Phenol
≤ 50mg/L,: Ca^{2+}, Cr (Ⅵ) , Anionic Surfactant
≤ 20mg/L,: Al^{3+}, CN^-, Galactose
≤ 10mg/L,: Ag^+ , Cu^{2+}, Mannose, Cationic Surfactant
≤ 5mg/L,: Fe^{3+}
≤ 1mg/L,: Residual Chlorine
< 1mg/L,: Fe^{2+}, Maltose

H_2O_2-C　Hydrogen Peroxide (High Range)

Color development: None → Yellow → Orange → Red brown
Method　　: Potassium Iodide
Range　　: 1 — 200 mg/L(ppm)
Reagent　　: WAK-H_2O_2 (C)　Tube
Reaction time : 1 minute after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 470 nm, 550 nm

Procedure

1. Press【H_2O_2-C】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Suck the whole amount of the sample in the Cell into the tube and press【Start】at the same time. (Fig.3)
6. Lightly shake the tube in Step 5 from 5 to 6 times, return the solution in the tube to the Cell in a gentle manner, set it again in the cell box. (Fig.4)
7. After 1 minute has elapsed, the concentration will be automatically displayed.

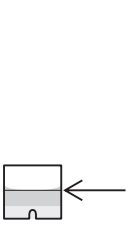


Fig.1

Fig.2

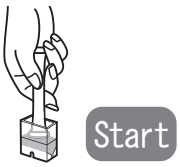


Fig.3

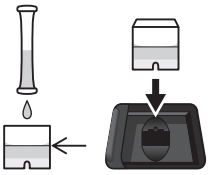


Fig.4

CAUTION

1. The optimum pH during color development is 4. If the pH of the sample is not within the range from 2 to 9, neutralize the sample with dilute sulfuric acid or dilute sodium hydroxide solution, etc.
2. Perform measurement with the sample temperature set to 15 to 30℃ .

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

Seawater does not affect the measurement.
Reductive substances such as Fe^{2+} and NO_2^- consume hydrogen peroxide.
NO_2^- may serve as an oxidizer and may cause a positive measurement error.
Oxidizing substances such as residual chlorine and ozone cause a positive measurement error.

≤ 1000mg/L,: Al^{3+} , B (Ⅲ) , Ca^{2+} , Cl^- , F^- , K^+ , Mg^{2+} , Mn^{2+} , Mo (Ⅵ) , Na^+ , NH_4^+ , Ni^{2+} , NO_3^- , PO_4^{3-} , SO_4^{2-} , Phenol
≤ 100mg/L,: Ba^{2+}
≤ 50mg/L,: Cr (Ⅵ) , Zn^{2+} , Anionic Surfactant
≤ 5mg/L,: Cu^{2+} , Fe^{3+}

H_2O_2 Hydrogen Peroxide

Color development: None → Light purple → Purple
Method : 4-Aminoantipyrine with enzyme
Range : 0.10 — 2.50 mg/L(ppm)
Reagent : WAK-H_2O_2 Tube
Reaction time : 2 minutes after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 539 nm, 590 nm

Procedure

1. Press【H_2O_2】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Suck the whole amount of the sample in the Cell into the tube and press【Start】at the same time. (Fig.3)
6. Lightly shake the tube in Step 5 from 5 to 6 times, return the solution in the tube to the Cell in a gentle manner, set it again in the cell box. (Fig.4)
7. After 2 minutes have elapsed, the concentration will be automatically displayed.

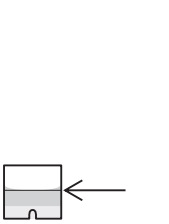


Fig.1

Fig.2

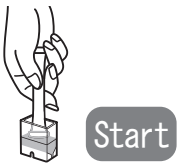


Fig.3

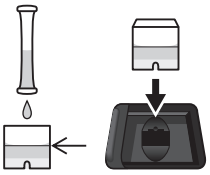


Fig.4

CAUTION

1. The optimum pH during color development is 7. If the pH of the sample is not within the range from 6 to 9, neutralize the sample with dilute sulfuric acid or dilute sodium hydroxide solution, etc.
2. Perform measurement with the sample temperature set to 15 to 30℃ .
3. If the concentration of hydrogen peroxide in the sample is 25 mg/L or less, the result is displayed as "OVER". However, note that if the concentration is 50 mg/L or higher, the color development becomes pale, and a result may be obtained from a sample exceeding the measurement range.

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

Seawater does not affect the measurement.
Reductive substances such as Fe^{2+} and NO_2^- consume hydrogen peroxide.
Oxidizing substances such as residual chlorine and ozone cause a positive measurement error.

≤ 1000mg/L,: Ag^+ , B (Ⅲ) , Ba^{2+} , Ca^{2+} , Cl^- , I^- , K^+ , Mg^{2+} , Na^+ , NH_4^+ , Ni^{2+} , NO_3^- , PO_4^{3-} , SO_4^{2-} , Zn^{2+}
≤ 500mg/L,: F^- , Fe^{3+} , NO_2^-
≤ 250mg/L,: Phenol
≤ 50mg/L,: Cr^{3+} , Cr (Ⅵ) , Cu^{2+} , Anionic Surfactant
≤ 20mg/L,: Al^{3+} , Co^{2+} , Mn^{2+}
≤ 2mg/L,: Mo (Ⅵ)
≤ 1mg/L,: CN^-
< 1mg/L,: Fe^{2+} , Residual Chlorine

HYD　Hydrazine

Color development : None → Yellow
Method : *p*-Dimethylaminobenzaldehyde
Range : 0.03 — 1.00 mg/L(ppm)
Reagent : WAK-HYD　K-1(Dropper),　Tube
Reaction time : 20 minutes after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 455 nm, 480 nm

Procedure

1. Press【HYD】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Add two droplet of K-1 reagent, attach the cap, and shake the Cell 2 to 3 times. (Fig.3)
6. Suck the whole amount of the sample in the Cell into the tube and press【Start】at the same time. (Fig.4)
7. Shake the tube in Step 6 by overturning it to right and left for 60 times in 1 minute. (Fig.5)
8. Gently return the solution in the tube to the Cell, set it again in the cell box. (Fig.6)
9. After 20 minutes have elapsed, the concentration will be automatically displayed.

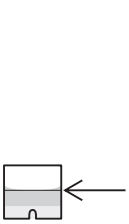


Fig.1

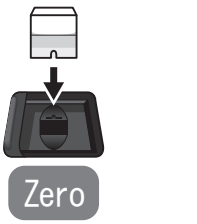


Fig.2

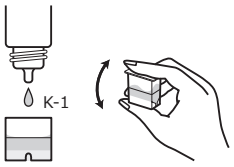


Fig.3

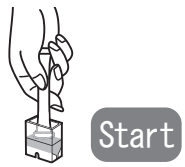


Fig.4

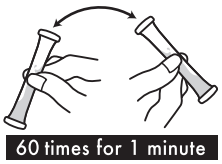


Fig.5

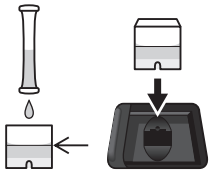


Fig.6

CAUTION

1. The optimum pH during color development is ≤2. Neutralize a sample of pH9 or greater with dilute sulfuric acid.
2. Perform measurement withe the sample temperature set to 15 to 30℃ .

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

Seawater does not affect the measurement.

≤ 1000mg/L,: Al^{3+}, B (Ⅲ), Ca^{2+}, Cl^-, Co^{2+}, Cu^{2+}, F^-, Fe^{2+}, I^-, K^+, Mg^{2+}, Mn^{2+}, Na^+, NH_4^+, Ni^{2+}, NO_3^-, PO_4^{3-}, SO_4^{2-}, Zn^{2+}, Silica, Phenol
≤ 500mg/L,: CN^-, Mo (Ⅵ), SO_3^{2-}
≤ 200mg/L,: Cr^{3+}
≤ 100mg/L,: Anionic Surfactant
≤ 50mg/L,: Fe^{3+}
≤ 5mg/L,: Ba^{2+}
≤ 1mg/L,: V (Ⅴ)
< 1mg/L,: Cr (Ⅵ), NO_2^-, Residual Chlorine

$KMnO_4$ Potasium Permanganate Consumption

Color development : Red purple → Green
Method : Oxidation by potassium permanganate in alkaline
Range : 2.0 — 10.0 mg/L(ppm)
Reagent : LR-COD-B-2 No.44 R-1 (Liquid) , R-2 (Liquid) , Neutralizer (Dropper)
Reaction time : 10 minutes after R-2 reagent is added.

Cell : PACKTEST Square Cup
Wavelength : 525 nm

Procedure

1. Press【$KMnO_4$】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 1.5 mL (up to line) and fill the Round Cell with the sample for 25 mL (up to white line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. Discard the sample in the Cell. (Fig.2)
5. Add 0.5 mL of R-1 reagent into the Round Cell using the supplied syringe, tightly attach the cap, and stir the solution 5 to 6 times. (Fig.3)
6. Add 1mL of R-2 reagent into the Round Cell using the supplied pipette, and press【Start】. (Fig.4)
7. Tightly attach the cap and stir the solution 5 to 6 times. (Fig.5)
8. Within 10 minutes, pour 1.5 mL of the solution in the Round Cell into the Cell that has gone through zero adjustment, and put the Cell in the cell box. (At this point, clean the Cell with the solution contained in the Round Cell.)(Fig.6)
9. After 10 minutes have elapsed, the concentration will be automatically displayed.
10. Dispose of the wastewater in the Round Cell as of after measurement by adding about 8 droplets (0.5 mL) of neutralizer to it and confirming that it has become approximately neutral.

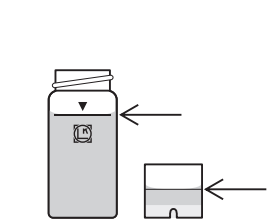


Fig.1

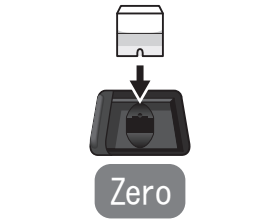


Fig.2

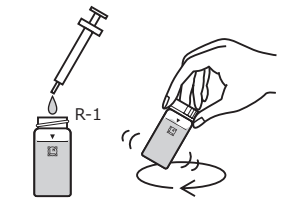


Fig.3

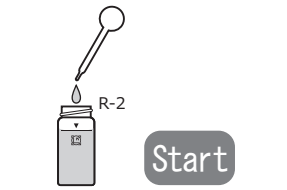


Fig.4


Fig.5

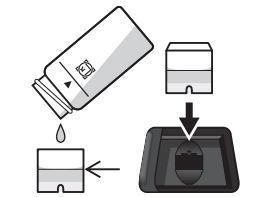


Fig.6

CAUTION

1. The optimum pH during color development is 12 or more. To an acid sample, add dilute sodium hydroxide solution or the like so as to adjust the pH of the sample to 6 or more.
2. Perform measurement with the sample temperature set to 15 to 25℃ .
3. Before filling the Cell with the solution in the measurement procedure Steps 8, rinse the Cup with the solution 2 to 3 times.
4. It is not possible to measure seawater.

Relationship with official method

While the measurement method of of potassium permanganate consumption is stipulated in Standard Methods for the Examination of Water (Japan Water Works Association) or other regulations, the measurement method we offer applies the alkali method (COD_{OH}) according to JIS K 0102 19 and allows simple measurement in a short period of time.
In the Standard Methods for the Examination of Water, the amount of potassium permanganate that has been consumed in a boiled water bath for 5 minutes under the acid condition is obtained through titration. On the other hand, the measurement method we offer obtains the amount of potassium permanganate that has been consumed at a room temperature for 10 minutes under the alkali condition from the decrease amount of absorbance.
Verification is conducted by using glucose reference solution, but the degree of oxidation of oxidized substance in the sample by potassium permanganate differs depending on the type and the amount of the substance.
As the values obtained by this measurement method are only approximate values and may not coincide with values obtained by the Standard Methods for the Examination of Water, use this method after obtaining the relationship between those methods.

MAL　M-Alkalinity

Color development: Yellow → Green → Blue-green
Method　　: Absorptiometry with pH Indicator for Buffering Capacity
Range　　: 20 — 80 mg/L(ppm)
Reagent　　: WAK-MAL　Tube
Reaction time : 2 minutes after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 470 nm, 560 nm

Procedure

1. Press【MAL】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Suck the whole amount of the sample in the Cell into the tube and press【Start】at the same time. (Fig.3)
6. Shake the tube in Step 5 about 15 times to dissolve the reagent in the tube completely. (Fig.4)
7. Gently return the solution in the tube to the Cell, set it again in the cell box. (Fig.5)
8. After 2 minutes have elapsed, the concentration will be automatically displayed.

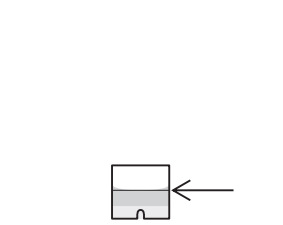


Fig.1

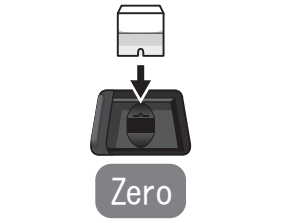


Fig.2

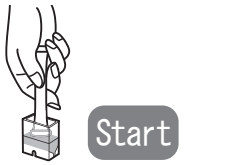


Fig.3

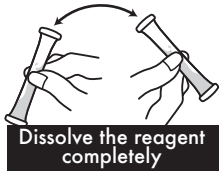


Fig.4

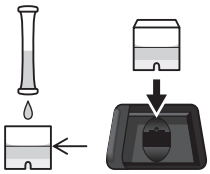


Fig.5

CAUTION

1. In this method, M-alkalinity (Total alkalinity: OH^-, HCO_3^-, CO_3^{2-}, etc.) in the sample is measured.
2. The measurement value is the concentration as calcium carbonate (mg/L as $CaCO_3$).
   The obtained result can be converted into the equivalent concentration (normality, Unit: meq/L) by multiplying it by 0.020.
   M-alkalinity of the typical natural water is derived from HCO_3^- (hydrogencarbonate, bicarbonate) . In order to convert the obtained result into the concentration of HCO_3^-, multiply it by 1.22.
3. The measurement result may be affected by unclean conditions. Clean up your hands before the measurement.
4. From the definition, M-alkalinity of the sample which is pH below 4.8 is zero. If the sample contains large amount of acid, the color of the solution in the tube may turn to dark yellow or orange.
5. Perform measurement with the sample temperature set to 15 to 30 ℃ .
6. Larger or smaller sample volume will imply higher or lower value, respectively.
   Use of a measuring pipette or the like to measure the volume of the sample (1.5mL) enables more accurate measurement.

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.
Seawater does not affect the measurement, but it may contain alkalinity more than measurement range.
Less than 10% of ethanol does not affect the measurement.
In this method, alkalinity which is derived from phosphate (HPO_4^{2-}、PO_4^{3-}), borate (BO_2^-、$B_4O_7^{2-}$, etc.) and ammonia (NH_3) is measured, but phosphate which is more than 200 mg/L as PO_4^{3-} causes negative error.

≤ 1000mg/L,: H_3BO_3 (Boric acid)、Ba^{2+}、Br^-、Ca^{2+}、Cl^-、I^-、K^+、Mg^{2+}、Mn^{2+}、Na^+、NH_4^+、$N_2H_5^+$ (Hydrazinium)、NO_3^-、SO_4^{2-}、Glucose、Phenol
≤ 200mg/L,: $H_2PO_4^-$
≤ 50mg/L,: Anionic Surfactant
≤ 20mg/L,: Nonionic surfactant
≤ 10mg/L,: F^-、NO_2^-
≤ 5mg/L,: Residual Chlorine、Cationic Surfactant

PAL　P-Alkalinity

Color development: Yellow → Brown → Purple
Method　　: Absorptiometry with pH Indicator for Buffering Capacity
Range　　: 100 — 600 mg/L(ppm)
Reagent　　: WAK-PAL　Tube
Reaction time : 1 minute after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 488 nm, 623 nm

Procedure

1. Press【PAL】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Suck the whole amount of the sample in the Cell into the tube and press【Start】at the same time. (Fig.3)
6. Shake the tube in Step 5 about 15 times to dissolve the reagent in the tube completely. (Fig.4)
7. Gently return the solution in the tube to the Cell, set it again in the cell box. (Fig.5)
8. After 1 minute has elapsed, the concentration will be automatically displayed.

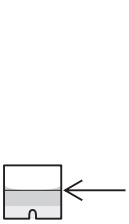


Fig.1

Fig.2

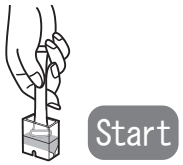


Fig.3

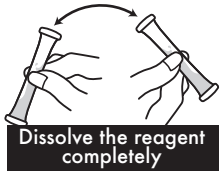


Fig.4

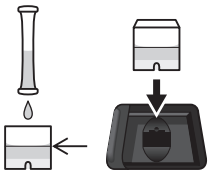


Fig.5

CAUTION

1. In this method, P-alkalinity (Phenolphthalein alkalinity: OH^-, CO_3^{2-}, etc.) in the sample is measured.
2. The measurement value is the concentration as calcium carbonate (mg/L as $CaCO_3$).
   The obtained result can be converted into the equivalent concentration (normality, Unit: meq/L) by multiplying it by 0.020.
3. The measurement result may be affected by unclean conditions. Clean up your hands before the measurement.
4. From the definition, P-alkalinity of the sample which is pH below 8.3 is zero. If the sample shows highly acidic pH, the color of the solution in the tube may turn to red or orange.
5. Perform measurement with the sample temperature set to 15 to 30 ℃ .
6. Larger or smaller sample volume will imply higher or lower value, respectively.
   Use of a measuring pipette or the like to measure the volume of the sample (1.5mL) enables more accurate measurement.

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

≤ 1000mg/L,: Ba^{2+}、Br^-、Ca^{2+}、Cl^-、HCO_3^-、F^-、I^-、K^+、Mg^{2+}、Na^+、NO_2^-、NO_3^-、HPO_4^{2-}、SO_4^{2-}、Glucose、Phenol
≤ 500mg/L,: Nonionic Surfactant
≤ 50mg/L,: Anionic Surfactant
≤ 20mg/L,: Cationic Surfactant
≤ 1mg/L,: Residual Chlorine

Seawater does not affect the measurement.
Less than 5% of ethanol does not affect the measurement.

Mn　Manganese

Color development: None → Light red → Red
Method　　: Potassium Periodate
Range　　: 0.5 — 20.0 mg/L(ppm)
Reagent　　: WAK-Mn　Tube
Reaction time : 3 minutes after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 537 nm

Procedure

1. Press【Mn】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Suck the whole amount of the sample in the Cell into the tube and press【Start】at the same time. (Fig.3)
6. Lightly shake the tube in Step 5 from 5 to 6 times, return the solution in the tube to the Cell in a gentle manner, set it again in the cell box. (Fig.4)
7. After 3 minutes have elapsed, the concentration will be automatically displayed.

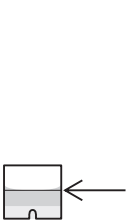


Fig.1

Fig.2

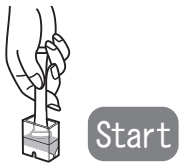


Fig.3

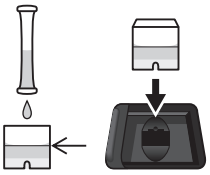


Fig.4

CAUTION

1. In this method, the concentration of ionized divalent to hexavalent manganese in the sample is measured.
   If result of manganese concentration including suspension and precipitate is required, dissolve manganese in advance and then perform measurement.
2. To measure the concentration of manganese, including septivalent manganese ions (red), conduct reduction in advance and then perform measurement. Or perform zero adjustment by using a sample whose red color is decolored by adding a large amount of reducing agent, discard the sample and thoroughly clean the Cell, take the sample again, and perform measurement as usual by sucking the sample into the tube.
3. The optimum pH during color development is 7. If the pH of the sample is not within the range from 5 to 9, neutralize the sample with dilute sulfuric acid or dilute sodium hydroxide solution, etc.
4. Perform measurement with the sample temperature set to 15 to 30℃ .

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

Seawater does not affect the measurement.
The existence of a large amount of reductive substance causes a negative measurement error.
For example, in the case of sodium hydrogen sulfite, its coexistence at 10 g/L or more affects the measurement value.

≤ 1000mg/L,: B (Ⅲ) , Ca^{2+} , Cl^- , F^- , K^+ , Mg^{2+} , Mo (Ⅵ) , Na^+ , NH_4^+ , NO_3^- , PO_4^{3-} , SO_4^{2-} , Anionic Surfactant , Residual Chlorine , Formaldehyde
≤ 500mg/L,: Ni^{2+}
≤ 200mg/L,: Al^{3+} , Ba^{2+} , Zn^{2+}
≤ 100mg/L,: Cu^{2+} , Fe^{2+} , Fe^{3+}
≤ 50mg/L,: Cr (Ⅵ) , NO_2^-
≤ 20mg/L,: CN^- , Co^{2+}
≤ 5mg/L,: Cr^{3+} , I^- , Phenol

Mo　Molybdenum

Color development: None → Yellow → Brown → Red
Method　　: Modified Catechol
Range　　: 5 — 150 mg/L(ppm)
Reagent　　: WAK-Mo　Tube
Reaction time : 2 minutes after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 555 nm, 670 nm

Procedure

1. Press【Mo】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Suck the whole amount of the sample in the Cell into the tube and press【Start】at the same time. (Fig.3)
6. Lightly shake the tube in Step 5 from 5 to 6 times, return the solution in the tube to the Cell in a gentle manner, set it again in the cell box. (Fig.4)
7. After 2 minutes have elapsed, the concentration will be automatically displayed.

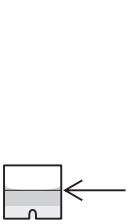


Fig.1

Fig.2

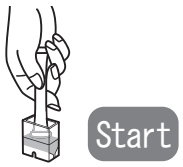


Fig.3

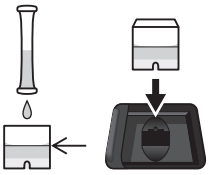


Fig.4

CAUTION

1. In this method, the concentration of molybdenum(VI) in molybdate ion (MoO_4^{2-}) state is measured and is displayed as a converted value of molybdenum (Mo).
   If result of molybdenum concentration including suspension and precipitate is required, dissolve molybdenum in advance and then perform measurement.
2. It is not possible to measure the concentration of molybdenum sulfide.
3. The obtained result can be converted into the concentration of molybdate ion (MoO_4^{2-}) by multiplying it by 1.67.
4. The optimum pH during color development is 7. If the pH of sample is not within the range from 4 to 9, neutralize the sample with dilute sulfuric acid or dilute sodium hydroxide solution, etc.
5. Perform measurement withe the sample temperature set to 15 to 30℃

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

Seawater does not affect the measurement.

≤ 1000mg/L,: Ba^{2+}, Ca^{2+}, Cl^-, F^-, I^-, K^+, Mg^{2+}, Mn^{2+}, Na^+, NH_4^+, NO_2^-, NO_3^-, SO_3^{2-}, SO_4^{2-}, Zn^{2+}, Anionic Surfactant , Hydrazine , Phenol
≤ 500mg/L,: CN^- , Co^{2+} , Residual Chlorine
≤ 200mg/L,: B (Ⅲ) , Cr^{3+} , Cr (Ⅵ) , Ni^{2+}
≤ 20mg/L,: Cu^{2+}
≤ 10mg/L,: Fe^{2+} , Fe^{3+}
≤ 2mg/L,: Al^{3+} ,
< 1mg/L,: V (V)

Ni-D　Nickel (DPM)

Color development: None → Light Pink → Pink
Method　　: Nioxime
Range　　: 0.3 — 10.0 mg/L(ppm)
Reagent　　: WAK-Ni (D)　Tube
Reaction time : 2 minutes after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 550 nm, 535 nm, 670 nm

Procedure

1. Press【Ni-D】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Suck the whole amount of the sample in the Cell into the tube and press【Start】at the same time. (Fig.3)
6. Shake the tube in Step 5 by overturning it to right and left for 60 times in 1 minute. (Fig.4)
7. Return the solution in the tube to the Cell in a gentle manner, set it again in the cell box. (Fig.5)
8. After 2 minutes have elapsed, the concentration will be automatically displayed.

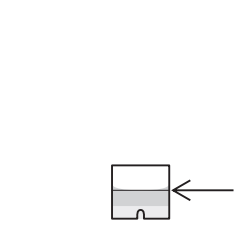


Fig.1

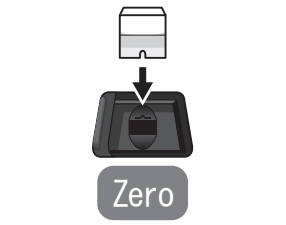


Fig.2

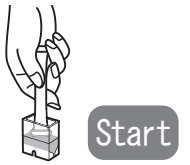


Fig.3

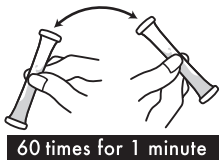


Fig.4

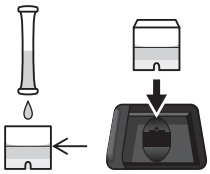


Fig.5

CAUTION

1. In this method, the concentration of ionized nickel (Ni^{2+}) in the sample is measured. If a result including turbid, deposition, and complex is required, dissolve the target substance in advance and then perform measurement.
2. The optimum pH during color development is 4. If the pH of the sample is not within the range from 4 to 9, neutralize the sample with dilute sulfuric acid or dilute sodium hydroxide solution, etc.
3. Perform measurement with the sample temperature set to 15 to 30℃ .

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

Seawater does not affect the measurement.

≤ 1000mg/L,: B (Ⅲ) , Ca^{2+} , Cl^- , Cr^{3+} , F^- , I^- , K^+ , Mg^{2+} , Mn^{2+} , Mo (Ⅵ) , Na^+ , NH_4^+ , NO_2^- , NO_3^- , PO_4^{3-} , SO_4^{2-} , Zn^{2+} , Phenol
≤ 500mg/L,: Ag^+ , Residual Chlorine
≤ 100mg/L,: Anionic Surfactant
≤ 50mg/L,: Ba^{2+} , Cr (Ⅵ)
≤ 20mg/L,: Al^{3+} , Co^{2+}
≤ 10mg/L,: Fe^{3+}
≤ 2mg/L,: Fe^{2+}
≤ 1mg/L,: CN^-
< 1mg/L,: Cu^{2+}

NH_4 Ammonium

Color development: None → Light blue → Blue
Method : Indophenol Blue
Range : 0.20 — 5.00 mg/L(ppm)
Reagent : WAK-NH_4-4 Tube
Reaction time : 10 minutes after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 643 nm, 590 nm

Procedure

1. Press【NH_4】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Submerge the aperture of the tube in the sample, and release your finger to suck the whole amount of the sample at once. At the same time, press【Start】. (Fig.3)
6. Shake the tube in Step 5 by overturning it to right and left for 30 times in 30 seconds. (Fig.4)
7. Immediately return the solution in the tube to the Cell in a gentle manner, set it again in the cell box. (Fig.5)
8. After 10 minutes have elapsed, the concentration will be automatically displayed.

Fig.1

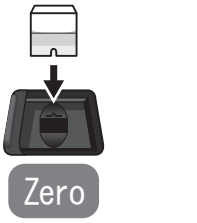


Fig.2

Fig.3

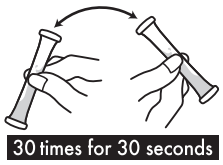


Fig.4

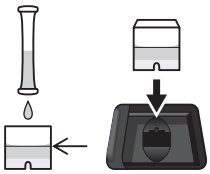


Fig.5

CAUTION

1. The optimum pH during color development is 13. If the pH of the sample is not within the range from 5 to 13, neutralize the sample with dilute sulfuric acid or dilute sodium hydroxide solution, etc.
2. Perform measurement with the sample temperature set to 15 to 30℃ .
3. As the results tend to vary, note the following points to acquire accurate results.
   - To suck the sample into the tube, release your finger while depressing the aperture of the tube against the bottom of the Cell to suck the whole amount of the sample at once.
   - Immediately after having sucked the sample into the tube, start shaking the tube.
   - Shake the tube by overturning it to right and left so that the sample moves all the way to both ends of the tube. Shake the tube for 30 seconds (one reciprocation per second).
4. After the tube is shaken in Step 6 of "Procedure", immediately and gently return the solution in the tube to the Cell. If you take time before returning the solution, turbid may be generated.

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

It is not possible to measure seawater.
To measure seawater or a sample containing a large amount of coexistent substances, perform measurement after separating ammonium ions by distillation because turbid or abnormal color development causes an error.
To perform distillation according to the JIS K 0102 42.1 distillation method.

Except for Heavy metal ions:

≤ 1000mg/L,: B (Ⅲ) , Cl^- , F^- , I^- , K^+ , Na^+ , NO_3^- , SO_4^{2-} , Anionic Surfactant , Residual Chlorine
≤ 500mg/L,: Phenol
≤ 250mg/L,: PO_4^{3-}
≤ 100mg/L,: Ca^{2+}
≤ 50mg/L,: Mg^{2+} , NO_2^-
≤ 5mg/L,: Formaldehyde

Heavy metal ions:

≤ 250mg/L,: Zn^{2+}
≤ 100mg/L,: Ba^{2+} , Cr (Ⅵ) , Ni^{2+}
≤ 50mg/L,: Al^{3+}
≤ 25mg/L,: Cr^{3+} , Mo (Ⅵ)
≤ 10mg/L,: Ag^+ , Cu^{2+}
≤ 5mg/L,: Mn^{2+}
≤ 1mg/L,: Co^{2+}
< 1mg/L,: Fe^{2+} , Fe^{3+}

NH_4-N　Ammonium-Nitrogen

Color development: None → Light blue → Blue
Method　　: Indophenol Blue
Range　　: 0.20 — 4.00 mg/L(ppm)
Reagent　　: WAK-NH_4-4　Tube
Reaction time : 10 minutes after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 643 nm, 590 nm

Procedure

1. Press【NH_4-N】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Submerge the aperture of the tube in the sample, and release your finger to suck the whole amount of the sample at once. At the same time, press【Start】. (Fig.3)
6. Shake the tube in Step 5 by overturning it to right and left for 30 times in 30 seconds. (Fig.4)
7. Immediately return the solution in the tube to the Cell in a gentle manner, set it again in the cell box. (Fig.5)
8. After 10 minutes have elapsed, the concentration will be automatically displayed.

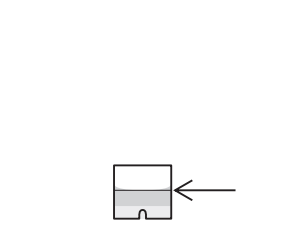


Fig.1

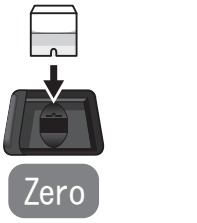


Fig.2

Fig.3

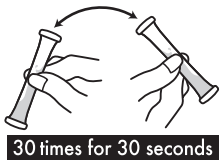


Fig.4

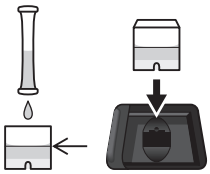


Fig.5

CAUTION

1. The optimum pH during color development is 13. If the pH of the sample is not within the range from 5 to 13, neutralize the sample with dilute sulfuric acid or dilute sodium hydroxide solution, etc.
2. Perform measurement with the sample temperature set to 15 to 30℃ .
3. As the results tend to vary, note the following points to acquire accurate results.
   - To suck the sample into the tube, release your finger while depressing the aperture of the tube against the bottom of the Cell to suck the whole amount of the sample at once.
   - Immediately after having sucked the sample into the tube, start shaking the tube.
   - Shake the tube by overturning it to right and left so that the sample moves all the way to both ends of the tube. Shake the tube for 30 seconds (one reciprocation per second).
4. After the tube is shaken in Step 6 of "Procedure", immediately and gently return the solution in the tube to the Cell. If you take time before returning the solution, turbid may be generated.

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

It is not possible to measure seawater.
To measure seawater or a sample containing a large amount of coexistent substances, perform measurement after separating ammonium ions by distillation because turbid or abnormal color development causes an error.
To perform distillation according to the JIS K 0102 42.1 distillation method.

Except for Heavy metal ions:

≤ 1000mg/L,: B (Ⅲ) , Cl^- , F^- , I^- , K^+ , Na^+ , NO_3^- , SO_4^{2-} , Anionic Surfactant , Residual Chlorine
≤ 500mg/L,: Phenol
≤ 250mg/L,: PO_4^{3-}
≤ 100mg/L,: Ca^{2+}
≤ 50mg/L,: Mg^{2+} , NO_2^-
≤ 5mg/L,: Formaldehyde

Heavy metal ions:

≤ 250mg/L,: Zn^{2+}
≤ 100mg/L,: Ba^{2+} , Cr (Ⅵ) , Ni^{2+}
≤ 50mg/L,: Al^{3+}
≤ 25mg/L,: Cr^{3+} , Mo (Ⅵ)
≤ 10mg/L,: Ag^+ , Cu^{2+}
≤ 5mg/L,: Mn^{2+}
≤ 1mg/L,: Co^{2+}
< 1mg/L,: Fe^{2+} , Fe^{3+}

NH_4-D　Ammonium (Low Range)

Color development: None → Light blue → Blue
Method　　: Distillation and Indophenol Blue
Range　　: 0.05 — 2.00 mg/L(ppm)
Reagent　　: LR-NH_4-A-2　No.17A　R-1（Liquid）, R-2（Small Pack）, R-3（Liquid）
Reaction time　: 5 minutes after R-3 reagent is added.
Other Items to Use：Water Analysis Set: Ammonium (Low Range) (Model: WA-NH_4(L)-2)
Preparation Procedure：Read the instruction for pretreatment reagent (WA-NH_4-DR).

Cell：PACKTEST Square Cup
Wavelength：637 nm, 590 nm

Procedure

1. Press【NH_4-D】.
2. Press【OK】to switch to the photometry window.
3. Adjust the volume of the solution captured through distillation to 25 mL if the volume is less than 25 mL, and then fill the Round Cell with the whole amount of the solution. Fill the Cell with pure water for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. Take out the Cell and discard the pure water. (Fig.2)
5. Add 3 mL of the R-1 reagent into the Round Cell using the supplied pipette. (Fig.3)
6. Add the R-2 reagent to the Round Cell, tightly attach the cap, immediately shake the Round Cell strongly for 10 seconds, and wait for 3 minutes. (Fig.4)
7. Add 2 mL of R-3 reagent to the Round Cell using the supplied pipette, press【Start】, tightly attach the cap, and stir the solution 5 to 6 times. (Fig.5)
8. Within 5 minutes, pour the solution in the Round Cell for 1.5 mL into the Cell that has gone through zero adjustment (up to line) and put the Cell in the cell box. (Fig.6)
9. After 5 minutes have elapsed, the concentration will be automatically displayed.

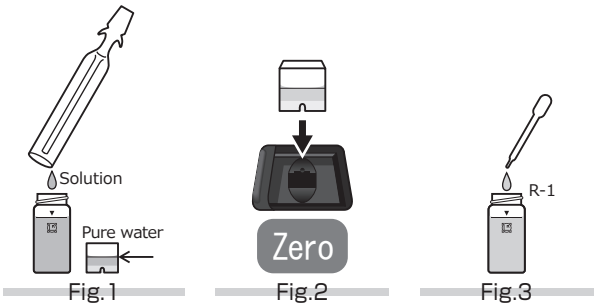


Fig.1

Fig.2

Fig.3

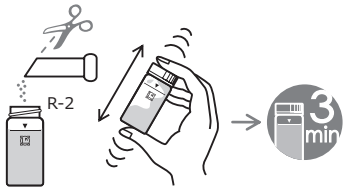


Fig.4

Fig.5

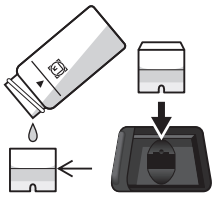


Fig.6

CAUTION

1. As the glass portion of the distiller becomes hot during distillation, be careful not to get burned.
2. Perform measurement with the solution temperature set to 20℃.
   If the solution temperature is other than 20 ℃, multiplying the measurement value by either of the following coefficients can implement correction.
   15℃・・・×1.2　　25℃・・・×0.75　　30℃・・・×0.65
   If the temperature is 40℃ or higher, the color will abnormally develop in red.
3. Use of a measuring pipette or the like instead of the supplied pipette enables more accurate measurement.

NH_4-N-D　Ammonium-Nitrogen (Low Range)

Color development: None → Light blue → Blue
Method　　: Distillation and Indophenol Blue
Range　　: 0.05 — 1.50 mg/L(ppm)
Reagent　　: LR-NH_4-A-2　No.17A　R-1（Liquid）, R-2（Small Pack）, R-3（Liquid）
Reaction time　: 5 minutes after R-3 reagent is added.
Other Items to Use：Water Analysis Set: Ammonium (Low Range) (Model: WA-NH_4(L)-2)
Preparation Procedure：Read the instruction for pretreatment reagent (WA-NH_4-DR).

Cell：PACKTEST Square Cup
Wavelength：637 nm, 590 nm

Procedure

1. Press【NH_4-N-D】.

2. Press【OK】to switch to the photometry window.

3. Adjust the volume of the solution captured through distillation to 25 mL if the volume is less than 25 mL, and then fill the Round Cell with the whole amount of the solution. Fill the Cell with pure water for 1.5 mL (up to line). (Fig.1)

4. Put the Cell in the cell box and press【Zero】. Take out the Cell and discard the pure water. (Fig.2)

5. Add 3 mL of the R-1 reagent into the Round Cell using the supplied pipette. (Fig.3)

6. Add the R-2 reagent to the Round Cell, tightly attach the cap, immediately shake the Round Cell strongly for 10 seconds, and wait for 3 minutes. (Fig.4)

7. Add 2 mL of R-3 reagent to the Round Cell using the supplied pipette, press【Start】, tightly attach the cap, and stir the solution 5 to 6 times. (Fig.5)

8. Within 5 minutes, pour the solution in the Round Cell for 1.5 mL into the Cell that has gone through zero adjustment (up to line) and put the Cell in the cell box. (Fig.6)

9. After 5 minutes have elapsed, the concentration will be automatically displayed.

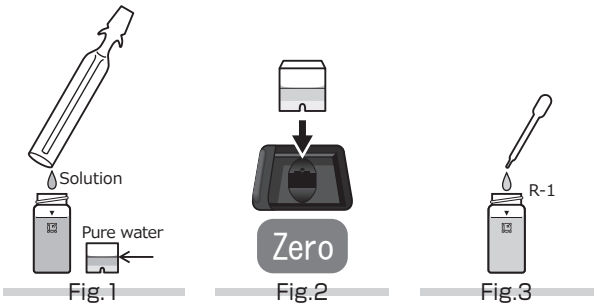


Fig.1

Fig.2

Fig.3

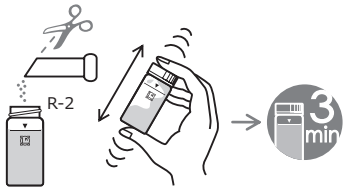


Fig.4

Fig.5

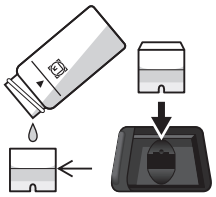


Fig.6

CAUTION

1. As the glass portion of the distiller becomes hot during distillation, be careful not to get burned.
2. Perform measurement with the solution temperature set to 20℃.
   If the solution temperature is other than 20 ℃, multiplying the measurement value by either of the following coefficients can implement correction.
   15℃・・・×1.2　　25℃・・・×0.75　　30℃・・・×0.65
   If the temperature is 40℃ or higher, the color will abnormally develop in red.
3. Use of a measuring pipette or the like instead of the supplied pipette enables more accurate measurement.

NO_2-C　Nitrite (High Range)

Color development : None → Light yellow → Reddish brown
Method　　: Griess Romijin
Range　　: 3 — 100 mg/L(ppm)
Reagent　　: WAK-NO_2 (C)　Tube
Reaction time : 5 minutes after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 560 nm

Procedure

1. Press【NO_2-C】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Suck the whole amount of the sample in the Cell into the tube and press【Start】at the same time. (Fig.3)
6. Lightly shake the tube in Step 5 from 5 to 6 times, and then wait for reaction for about 4 minutes. (Fig.4)
7. Gently return the solution in the tube to the Cell when the time count down reaches under 1 minute, set it again in the cell box. (Fig.5)
8. After 5 minutes have elapsed, the concentration will be automatically displayed.

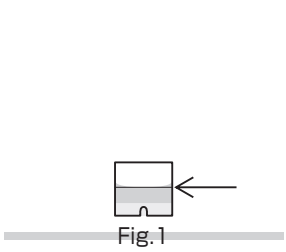


Fig.1　Fig.2

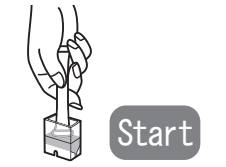


Fig.3

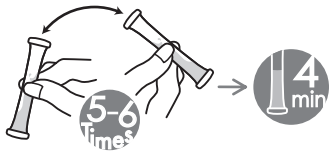


Fig.4

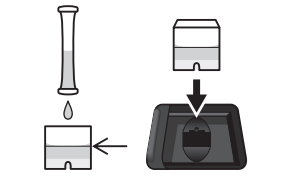


Fig.5

CAUTION

1. The optimum pH during color development is 3. If the pH of the sample is not within the range from 2 to 9, neutralize the sample with dilute sulfuric acid or dilute sodium hydroxide solution, etc.
2. Perform measurement with the sample temperature set to 15 to 30℃ .
3. Note that in this PACKTEST, a large amount of bubbles will be generated. If bubbles are attached to the inner wall of the Cell, remove them as much as possible by, for example, snapping the Cell with your finger.

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

Seawater does not affect the measurement.
Generally, nitrite ions do not coexist with oxidizing substances such as residual chlorine, but if residual chlorine and chloramines exist, they develop their color in red and may be mistaken as nitrite even when nitrite ions do not exist.

Except for Heavy metal ions:
≤ 100mg/L,: B (Ⅲ) , Ca^{2+} , Cl^- , F^- , I^- , K^+ , Mg^{2+} , Na^+ , NO_3^- , PO_4^{3-} , SO_4^{2-} , Anionic Surfactant , Phenol
≤ 50mg/L,: NH_4^+
≤ 5mg/L,: Residual Chlorine

Heavy metal ions:
≤ 10mg/L,: Al^{3+} , Ba^{2+} , CN^- , Co^{2+} , Cr^{3+} , Cu^{2+} , Fe^{2+} , Fe^{3+} , Mn^{2+} , Mo (Ⅵ) , Ni^{2+} , Zn^{2+}
≤ 1mg/L,: Cr (Ⅵ)

NO_2-N-C　Nitrite-Nitrogen (High Range)

Color development: None → Light yellow → Reddish brown
Method　　: Griess Romijin
Range　　: 1.0 — 30.0 mg/L(ppm)
Reagent　　: WAK-NO_2 (C)　Tube
Reaction time : 5 minutes after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 560 nm

Procedure

1. Press【NO_2-N-C】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Suck the whole amount of the sample in the Cell into the tube and press【Start】at the same time. (Fig.3)
6. Lightly shake the tube in Step 5 from 5 to 6 times, and then wait for reaction for about 4 minutes. (Fig.4)
7. Gently return the solution in the tube to the Cell when the time count down reaches under 1 minute, set it again in the cell box. (Fig.5)
8. After 5 minutes have elapsed, the concentration will be automatically displayed.

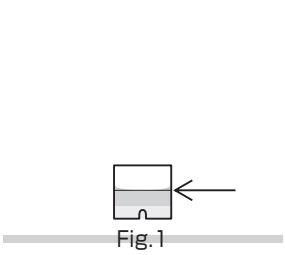


Fig.1　Fig.2

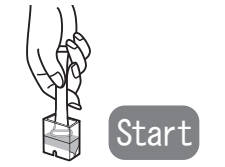


Fig.3

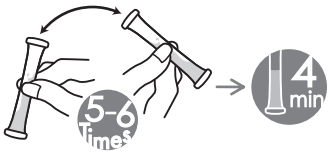


Fig.4

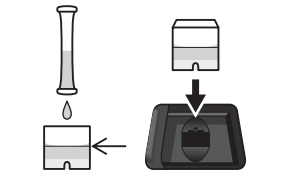


Fig.5

CAUTION

1. The optimum pH during color development is 3. If the pH of the sample is not within the range from 2 to 9, neutralize the sample with dilute sulfuric acid or dilute sodium hydroxide solution, etc.
2. Perform measurement with the sample temperature set to 15 to 30℃ .
3. Note that in this PACKTEST, a large amount of bubbles will be generated. If bubbles are attached to the inner wall of the Cell, remove them as much as possible by, for example, snapping the Cell with your finger.

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

Seawater does not affect the measurement.
Generally, nitrite ions do not coexist with oxidizing substances such as residual chlorine, but if residual chlorine and chloramines exist, they develop their color in red and may be mistaken as nitrite even when nitrite ions do not exist.

Except for Heavy metal ions:
≤ 100mg/L,: B (Ⅲ) , Ca^{2+} , Cl^- , F^- , I^- , K^+ , Mg^{2+} , Na^+ , NO_3^- , PO_4^{3-} , SO_4^{2-} , Anionic Surfactant , Phenol
≤ 50mg/L,: NH_4^+
≤ 5mg/L,: Residual Chlorine

Heavy metal ions:
≤ 10mg/L,: Al^{3+} , Ba^{2+} , CN^- , Co^{2+} , Cr^{3+} , Cu^{2+} , Fe^{2+} , Fe^{3+} , Mn^{2+} , Mo (Ⅵ) , Ni^{2+} , Zn^{2+}
≤ 1mg/L,: Cr (Ⅵ)

NO_2 Nitrite

Color development: None → Light red → Red
Method : Naphthylethylenediamine
Range : 0.02 — 1.00 mg/L(ppm)
Reagent : WAK-NO_2 Tube
Reaction time : 3 minutes after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 539 nm, 570 nm

Procedure

1. Press【NO_2】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Suck the whole amount of the sample in the Cell into the tube and press【Start】at the same time. (Fig.3)
6. Lightly shake the tube in Step 5 from 5 to 6 times, return the solution in the tube to the Cell in a gentle manner, set it again in the cell box. (Fig.4)
7. After 3 minutes have elapsed, the concentration will be automatically displayed.

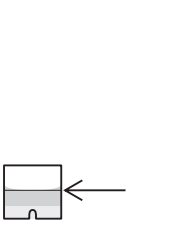


Fig.1

Fig.2

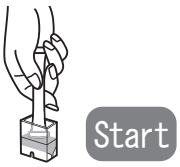


Fig.3

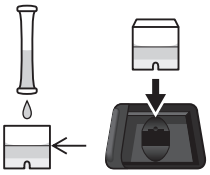


Fig.4

CAUTION

1. The optimum pH during color development is 3. If the pH of the sample is not within the range from 2 to 9, neutralize the sample with dilute sulfuric acid or dilute sodium hydroxide solution, etc.
2. Perform measurement with the sample temperature set to 15 to 30℃ .
3. As nitrite also exists in the air and may be dissolved in pure water, pay due attention during measurement at low concentration.

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

Seawater does not affect the measurement.
Generally, nitrite ions do not coexist with oxidizing substances such as residual chlorine, but if residual chlorine and chloramines exist, they develop their color in red and may be mistaken as nitrite even when nitrite ions do not exist.

≤ 1000mg/L,: B (Ⅲ) , Ca^{2+} , Cl^- , F^- , I^- , K^+ , Mg^{2+} , Mn^{2+} , Na^+ , NH_4^+ , NO_3^- , PO_4^{3-} , SO_4^{2-} , Phenol
≤ 500mg/L,: Co^{2+}
≤ 250mg/L,: CN^- , Cr^{3+}
≤ 100mg/L,: Cu^{2+} , Mo (Ⅵ) , Zn^{2+}
≤ 50mg/L,: Ni^{2+}
≤ 25mg/L,: Fe^{2+}
≤ 10mg/L,: Al^{3+} , V (Ⅴ)
≤ 2mg/L,: Cr (Ⅵ) , Fe^{3+}
< 1mg/L,: Ag^+ , Ba^{2+} , Residual Chlorine

NO_2-N　Nitrite-Nitrogen

Color development: None → Light red → Red
Method　　: Naphthylethylenediamine
Range　　: 0.010 — 0.300 mg/L(ppm)
Reagent　　: WAK-NO_2　Tube
Reaction time : 3 minutes after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 539 nm, 570 nm

Procedure

1. Press【NO_2-N】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Suck the whole amount of the sample in the Cell into the tube and press【Start】at the same time. (Fig.3)
6. Lightly shake the tube in Step 5 from 5 to 6 times, return the solution in the tube to the Cell in a gentle manner, set it again in the cell box. (Fig.4)
7. After 3 minutes have elapsed, the concentration will be automatically displayed.

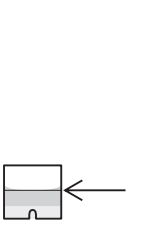


Fig.1

Fig.2

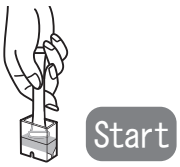


Fig.3

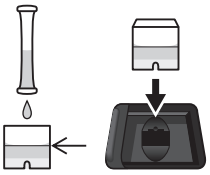


Fig.4

CAUTION

1. The optimum pH during color development is 3. If the pH of the sample is not within the range from 2 to 9, neutralize the sample with dilute sulfuric acid or dilute sodium hydroxide solution, etc.
2. Perform measurement with the sample temperature set to 15 to 30℃ .
3. As nitrite also exists in the air and may be dissolved in pure water, pay due attention during measurement at low concentration.

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
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≤ 500mg/L,: Co^{2+}
≤ 250mg/L,: CN^- , Cr^{3+}
≤ 100mg/L,: Cu^{2+} , Mo (Ⅵ) , Zn^{2+}
≤ 50mg/L,: Ni^{2+}
≤ 25mg/L,: Fe^{2+}
≤ 10mg/L,: Al^{3+} , V (Ⅴ)
≤ 2mg/L,: Cr (Ⅵ) , Fe^{3+}
< 1mg/L,: Ag^+ , Ba^{2+} , Residual Chlorine

NO_3-C　Nitrate (High Range)

In this analyte the procedure should be divided into 2 methods according to the sample state.
Be careful that each method uses their specified reagent.

1.NO_3-C_1　Nitrate (High Range) (NO_2^- ≤ 1mg/L)

Range　: 200 — 2000 mg/L (ppm)
Reagent　: WAK-NO_3(C)
Perform the regular Nitrate (High Range) measurement procedure.

2.NO_3-C_2　Nitrate (High Range) (NO_2^- 1 — 10mg/L)

Range　: 200 — 2000 mg/L (ppm)
Reagent　: Pretreatment reagent (NO_3-RA), WAK-NO_3(C)
It is necessary to remove Nitrite by pretreatment reagent before the regular Nitrate (High Range) measurement procedure.

NO_3-C_1　Nitrate (High Range) (NO_2^- ≤ 1mg/L)

Color development: None → Light yellow → Brown
Method　　: Reduction and Griess Romijin
Range　　: 200 — 2000 mg/L(ppm)
Reagent　　: WAK-NO_3 (C)　Tube
Reaction time : 5 minutes after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 560 nm

Procedure

1. Press【NO_3-C_1】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Submerge the aperture of the tube in the sample, and the release your finger to suck the whole amount of the sample at once. At the same time, press【Start】. (Fig.3)
6. Shake the tube in Step 5 by overturning it to right and left for 60 times in 1 minute, and then wait for reaction for about 3 minutes. (Fig.4)
7. Gently return the solution in the tube to the Cell when the time count down reaches under 1 minute, set it again in the cell box. (Fig.5)
8. After 5 minutes have elapsed, the concentration will be automatically displayed.

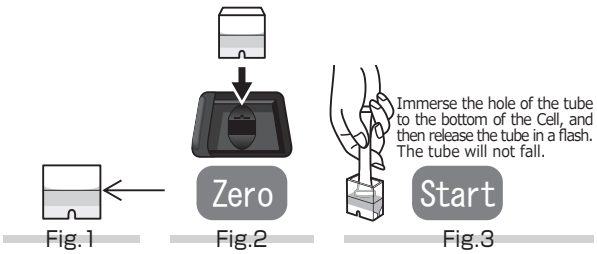

Fig.1　Fig.2　Fig.3

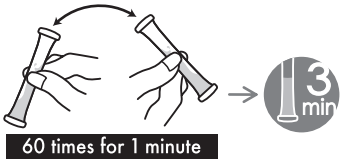

Fig.4

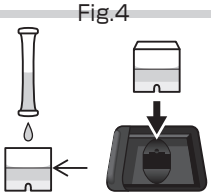
Fig.5

CAUTION

1. The optimum pH during color development is 3. If the pH of the sample is not within the range from 2 to 9, neutralize the sample with dilute sulfuric acid or dilute sodium hydroxide solution, etc.
2. Perform measurement with the sample temperature set to 20℃ .
   If the sample temperature is other than 20 ℃ , multiplying the measurement value by either of the following coefficients can implement correction.
   10℃・・・×0.80　　30℃・・・×1.1
3. As the results tend to vary, note the following points to acquire accurate results.
   - To suck the sample into the tube, release your finger while depressing the aperture of the tube against the bottom of the Cell to suck the sample at once.
   - Immediately after having sucked the sample into the tube, start shaking the tube.
   - Shake the tube by overturning it to right and left so that the sample moves all the way to both ends of the tube. Shake the tube for 1 minute (one reciprocation per second).
   - If the tube is shaken intensely, the measurement value will be low.
4. If nitrite ions coexist in the sample at a high concentration, as their color develops stronger than nitrate ions and greatly affects the result, perform measurement by following the procedures for "NO_3-C_2　Nitrate (High Range) (NO_2^- 1 — 10 mg/L)".
5. Note that in this PACKTEST, a large amount of bubbles will be generated. If bubbles are attached to the inner wall of the Cell, remove them as much as possible by, for example, snapping the Cell with your finger.

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

Seawater does not affect the measurement.
Oxidizing substance or reductive substance may affect the measurement.

Except for Heavy metal ions:

≤ 100mg/L,: B (Ⅲ) , Ca^{2+} , Cl^- , F^- , I^- , K^+ , Mg^{2+} , Na^+ , NH_4^+ , PO_4^{3-} , SO_4^{2-} , Phenol , Anionic Surfactant
≤ 10mg/L,: Residual Chlorine

Heavy metal ions:

≤ 10mg/L,: Al^{3+} , Ba^{2+} , CN^- , Cr^{3+} , Mn^{2+} , Mo (Ⅵ) , Zn^{2+}
≤ 1mg/L,: Cr (Ⅵ) , Fe^{3+} , Ni^{2+}
< 1mg/L,: Co^{2+} , Cu^{2+} , Fe^{2+}

NO_3-C_2　Nitrate (High Range) (NO_2^-　1 — 10mg/L)

Color development: None → Light yellow → Brown
Method　　: Reduction and Griess Romijin
Range　　: 200 — 2000 mg/L(ppm)
Reagent　　: Pretreatment reagent (NO_3-RA) (Pack) , WAK-NO_3 (C)　Tube
Other Items to Use : Beaker, Heater
Reaction time : 5 minutes after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 560 nm

Pretreatment method

First, remove the nitrite ions mixed in the sample by using pretreatment reagent.

1. Fill a beaker with 30 mL of sample, add pretreatment reagent (NO_3-RA) in the sample, and stir the sample 5 to 6 times. (Fig.1)
2. Heat the sample, boil it for 2 minutes, and cool it down to 15 to 30℃ . (Fig.2)
   If the amount of the sample has decreased after cooling down, add pure water up to 30 mL.
3. Fill the Cell with the pretreated sample for 1.5 mL (up to line). (Fig.3)

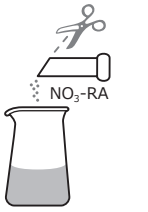

Fig.1


Fig.2

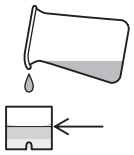
Fig.3

Procedure

1. Press 【NO_3-C_2】.
2. Press 【OK】 to switch to the photometry window.
3. Put the Cell filled with the pretreated sample in the cell box and press 【Zero】. (Fig.4)
4. Submerge the aperture of the tube in the sample, and the release your finger to suck the whole amount of the sample at once. At the same time, press 【Start】. (Fig.5)
5. Shake the tube in Step 4 by overturning it to right and left for 60 times in 1 minute, and then wait for reaction for about 3 minutes. (Fig.6)
6. Gently return the solution in the tube to the Cell when the time count down reaches under 1 minute, set it again in the cell box. (Fig.7)
7. After 5 minutes have elapsed, the concentration will be automatically displayed.

Fig.4

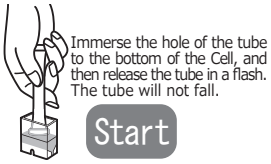

Fig.5

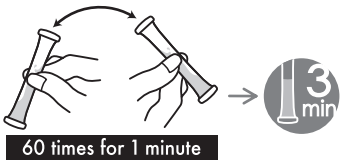

Fig.6

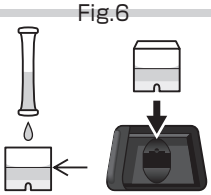
Fig.7

CAUTION

Refer to "NO_3-C_1　Nitrate (High Range) (NO_2^-≤1mg/L)".

NO_3-N-C Nitrate-Nitrogen (High Range)

In this analyte the procedure should be divided into 2 methods according to the sample state.
Be careful that each method uses their specified reagent.

1.NO_3-N-C1　Nitrate-Nitrogen (High Range) (NO_2^--N ≤ 0.3mg/L)

Range　: 45 — 450 mg/L (ppm)
Reagent　: WAK-NO_3(C)
Perform the regular Nitrate-Nitrogen (High Range) measurement procedure.

2.NO_3-N-C2　Nitrate-Nitrogen (High Range) (NO_2^--N　0.3 — 3mg/L)

Range　: 45 — 450 mg/L (ppm)
Reagent　: Pretreatment Reagent (NO_3-RA), WAK-NO_3(C)
It is necessary to remove Nitrite by pretreatment reagent before the regular Nitrate-Nitrogen (High Range) measurement procedure.

NO_3-N-C1　Nitrate-Nitrogen (High Range) (NO_2^--N ≤ 0.3mg/L)

Color development: None → Light yellow → Brown
Method　　: Reduction and Griess Romijin
Range　　: 45 — 450 mg/L(ppm)
Reagent　　: WAK-NO_3 (C)　Tube
Reaction time : 5 minutes after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 560 nm

Procedure

1. Press【NO_3-N-C 1】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Submerge the aperture of the tube in the sample, and the release your finger to suck the whole amount of the sample at once. At the same time, press【Start】. (Fig.3)
6. Shake the tube in Step 5 by overturning it to right and left for 60 times in 1 minute, and then wait for reaction for about 3 minutes. (Fig.4)
7. Gently return the solution in the tube to the Cell when the time count down reaches under 1 minute, set it again in the cell box. (Fig.5)
8. After 5 minutes have elapsed, the concentration will be automatically displayed.

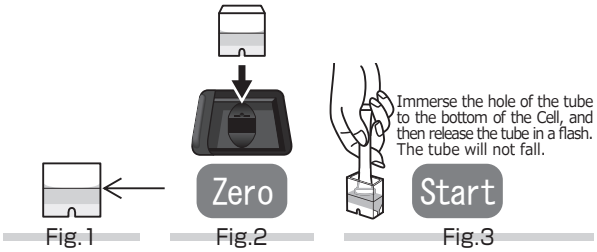

Fig.1　Fig.2　Fig.3

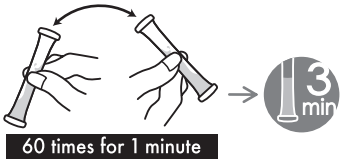

Fig.4

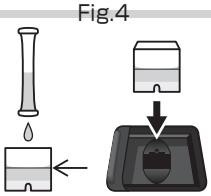
Fig.5

CAUTION

1. The optimum pH during color development is 3. If the pH of the sample is not within the range from 2 to 9, neutralize the sample with dilute sulfuric acid or dilute sodium hydroxide solution, etc.
2. Perform measurement with the sample temperature set to 20℃ .
   If the sample temperature is other than 20 ℃ , multiplying the measurement value by either of the following coefficients can implement correction.
   10℃・・・×0.80　　30℃・・・×1.1
3. As the results tend to vary, note the following points to acquire accurate results.
   - To suck the sample into the tube, release your finger while depressing the aperture of the tube against the bottom of the Cell to suck the sample at once.
   - Immediately after having sucked the sample into the tube, start shaking the tube.
   - Shake the tube by overturning it to right and left so that the sample moves all the way to both ends of the tube. Shake the tube for 1 minute (one reciprocation per second).
   - If the tube is shaken intensely, the measurement value will be low.
4. If nitrite ions coexist in the sample at a high concentration, as their color develops stronger than nitrate ions and greatly affects the result, perform measurement by following the procedures for "NO_3-N-C2　Nitrate-Nitrogen (NO_2^--N　0.3 — 3 mg/L)".
5. Note that in this PACKTEST, a large amount of bubbles will be generated. If bubbles are attached to the inner wall of the Cell, remove them as much as possible by, for example, snapping the Cell with your finger.

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

Seawater does not affect the measurement.
Oxidizing substance or reductive substance may affect the measurement.

Except for Heavy metal ions:

≤ 100mg/L,: B (Ⅲ) , Ca^{2+} , Cl^- , F^- , I^- , K^+ , Mg^{2+} , Na^+ , NH_4^+ , PO_4^{3-} , SO_4^{2-} , Phenol , Anionic Surfactant
≤ 10mg/L,: Residual Chlorine

Heavy metal ions:

≤ 10mg/L,: Al^{3+} , Ba^{2+} , CN^- , Cr^{3+} , Mn^{2+} , Mo (Ⅵ) , Zn^{2+}
≤ 1mg/L,: Cr (Ⅵ) , Fe^{3+} , Ni^{2+}
< 1mg/L,: Co^{2+} , Cu^{2+} , Fe^{2+}

NO_3-N-C2　Nitrate-Nitrogen (High Range) (NO_2^--N　0.3 — 3mg/L)

Color development: None → Light yellow → Brown
Method　　: Reduction and Griess Romijin
Range　　: 45 — 450 mg/L(ppm)
Reagent　　: Pretreatment reagent (NO_3-RA) (Pack) , WAK-NO_3 (C)　Tube
Other Items to Use : Beaker, Heater
Reaction time : 5 minutes after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 560 nm

Pretreatment method

First, remove the nitrite ions mixed in the sample by using pretreatment reagent.

1. Fill a beaker with 30 mL of sample, add pretreatment reagent (NO_3-RA) in the sample, and stir the sample 5 to 6 times. (Fig.1)

2. Heat the sample, boil it for 2 minutes, and cool it down to 15 to 30℃. (Fig.2)
   If the amount of the sample has decreased after cooling down, add pure water up to 30 mL.

3. Fill the Cell with the pretreated sample for 1.5 mL (up to line). (Fig.3)

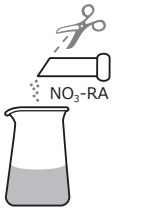

Fig.1


Fig.2

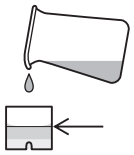
Fig.3

Procedure

1. Press【NO_3-N-C2】.

2. Press【OK】to switch to the photometry window.

3. Put the Cell filled with the pretreated sample in the cell box and press【Zero】. (Fig.4)

4. Submerge the aperture of the tube in the sample, and the release your finger to suck the whole amount of the sample at once. At the same time, press【Start】. (Fig.5)

5. Shake the tube in Step 4 by overturning it to right and left for 60 times in 1 minute, and then wait for reaction for about 3 minutes. (Fig.6)

6. Gently return the solution in the tube to the Cell when the time count down reaches under 1 minute, set it again in the cell box. (Fig.7)

7. After 5 minutes have elapsed, the concentration will be automatically displayed.

Fig.4

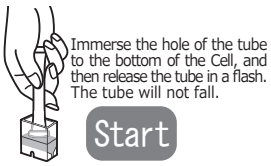

Fig.5

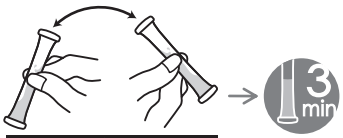

Fig.6

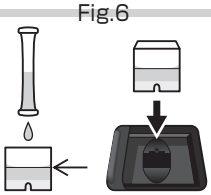
Fig.7

CAUTION

Refer to "NO_3-N-C1　Nitrate-Nitrogen (High Range) (NO_2^--N ≤0.3 mg/L)".

NO_3 Nitrate

In this analyte the procedure should be divided into 3 methods according to the sample state.
Be careful that each method uses their specified reagent.

1.NO_3_1 Nitrate (NO_2^- = 0mg/L)

Range : 1.0 — 25.0 mg/L (ppm)
Reagent : WAK-NO_3
Perform the regular Nitrate measurement procedure.

2.NO_3_2 Nitrate (NO_2^- ≤ 0.2mg/L)

Range : 1.0 — 25.0 mg/L (ppm)
Reagent : WAK-NO_2, WAK-NO_3
It is necessary to zero adjustment with the color-developed sample with reagent for Nitrite (WAK-NO_2) before the regular Nitrate measurement procedure.

3.NO_3_3 Nitrate (NO_2^- 0.2 — 5mg/L)

Range : 1.0 — 25.0 mg/L (ppm)
Reagent : Pretreatment reagent (NO_3-RA), WAK-NO_3(C)
It is necessary to remove Nitrite by pretreatment reagent before the regular Nitrate measurement procedure.

NO_3_1　Nitrate (NO_2^- = 0mg/L)

Color development : None → Light red → Red
Method : Reduction and Naphthylethylenediamine
Range : 1.0 — 25.0 mg/L(ppm)
Reagent : WAK-NO_3　Tube
Reaction time : 5 minutes after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 539 nm, 580 nm

Procedure

1. Press【NO_3_1】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Submerge the aperture of the tube in the sample, and the release your finger to suck the whole amount of the sample at once. At the same time, press【Start】. (Fig.3)
6. Shake the tube in Step 5 by overturning it to right and left for 60 times in 1 minute. (Fig.4)
7. Immediately return the solution in the tube to the Cell in a gentle manner, set it again in the cell box. (Fig.5)
8. After 5 minutes have elapsed, the concentration will be automatically displayed.

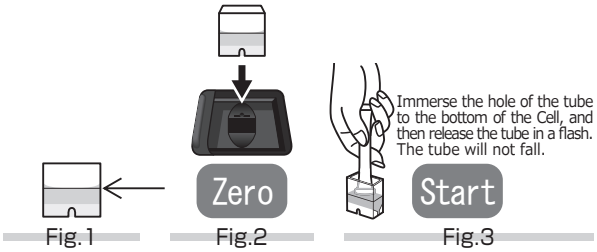

Fig.1　Fig.2　Fig.3

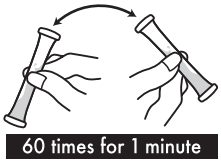

Fig.4

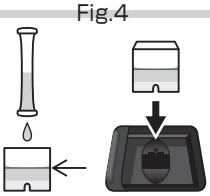
Fig.5

CAUTION

1. The optimum pH during color development is 3. If the pH of the sample is not within the range from 2 to 9, neutralize the sample with dilute sulfuric acid or dilute sodium hydroxide solution, etc.
2. Perform measurement with the sample temperature set to 15 to 30℃ .
3. As the results tend to vary, note the following points to acquire accurate results.
   - To suck the sample into the tube, release your finger while depressing the aperture of the tube against the bottom of the Cell to suck the sample at once.
   - Immediately after having sucked the sample into the tube, start shaking the tube.
   - Shake the tube by overturning it to right and left so that the sample moves all the way to both ends of the tube. Shake the tube for 1 minute (one reciprocation per second).
4. If nitrite ions coexist in the sample, as their color develops stronger than nitrate ions and greatly affects the result, perform measurement by following the procedures.
   "NO_3_2　Nitrate (NO_2^- ≤ 0.2 mg/L)"
   "NO_3_3　Nitrate (NO_2^- 0.2 — 5 mg/L)"

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.

The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

It is not possible to measure seawater.
Oxidizing substance or reductive substance may affect the measurement.

≤ 1000mg/L,: B (Ⅲ) , K^+ , Mg^{2+} , Mn^{2+} , Na^+ , NH_4^+ , PO_4^{3-} , Phenol
≤ 800mg/L,: Cl^-
≤ 200mg/L,: Al^{3+} , Ca^{2+} , F^- , Ni^{2+}
≤ 100mg/L,: CN^- , Fe^{3+}
≤ 50mg/L,: Co^{2+} , Cr^{3+} , Fe^{2+} , Zn^{2+}
≤ 5mg/L,: Ba^{2+} , I^-
≤ 1mg/L,: Cu^{2+} , Mo (Ⅵ) , Sn^{2+} , Residual Chlorine
≤ 0.5mg/L,: Cr (Ⅵ) , SO_3^{2-}
< 1mg/L,: NO_2^-

NO_3_2　Nitrate (NO_2^- ≤ 0.2mg/L)

Color development: None → Light red → Red
Method　　: Reduction and Naphthylethylenediamine
Range　　: 1.0 — 25.0 mg/L(ppm)
Reagent　　: WAK-NO_2　Tube,　WAK-NO_3　Tube
Reaction time : 5 minutes after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 539 nm, 580 nm

Pretreatment method

First, develop the color of nitrite ions.

1. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.1)
2. Suck the whole amount of the sample in the Cell into the tube (WAK-NO_2) and then lightly shake the tube 5 to 6 times. (Fig.2)
3. Return the solution to the Cell and wait for 3 minutes. (Fig.3)

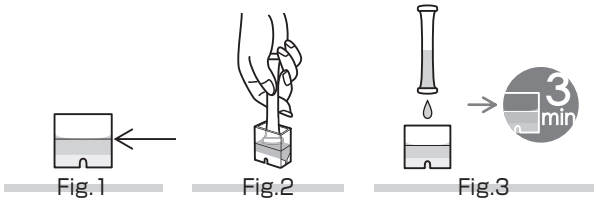

Fig.1　Fig.2　Fig.3

Procedure

1. Press【NO_3_2】.
2. Press【OK】to switch to the photometry window.
3. Put the Cell containing color-developed nitrite in the cell box and press【Zero】. (Fig.4)
4. Take the Cell out of the cell box, empty it, and clean it with pure water. (Fig.5)
5. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.6)
6. Submerge the aperture of the tube (WAK-NO_3) in the sample, and the release your finger to suck the whole amount of sample at once. At the same time, press【Start】. (Fig.7)
7. Shake the tube in Step 6 by overturning it to right and left for 60 times in 1 minute. (Fig.8)
8. Return the solution in the tube to the Cell in a gentle manner, set it again in the cell box. (Fig.9)
9. After 5 minutes have elapsed, the concentration will be automatically displayed.

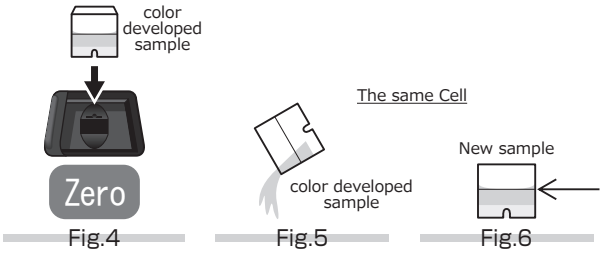

Fig.4　Fig.5　Fig.6

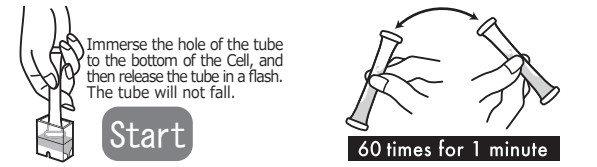

Fig.7　Fig.8

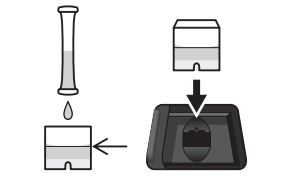
Fig.9

CAUTION

Refer to "NO_3_1 Nitrate (NO_2^- = 0 mg/L)".

NO_3_3　Nitrate (NO_2^- 0.2 — 5mg/L)

Color development: None → Light red → Red
Method　　: Reduction and Naphthylethylenediamine
Range　　: 1.0 — 25.0 mg/L(ppm)
Reagent　　: Pretreatment reagent (NO_3-RA) (Pack) ,　WAK-NO_3　Tube
Other Items to Use : Beaker, Heater
Reaction time : 5 minutes after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 539 nm, 580 nm

Pretreatment method

First, remove the nitrite ions mixed in the sample by using pretreatment reagent.

1. Fill a beaker with 30 mL of sample, add pretreatment reagent (NO_3-RA) in the sample, and stir the sample 5 to 6 times. (Fig.1)

2. Heat the sample, boil it for 2 minutes, and cool it down to 15 to 30℃ . (Fig.2)
   If the amount of the sample has decreased after cooling down, add pure water up to 30 mL.

3. Fill the Cell with the pretreated sample for 1.5 mL (up to line). (Fig.3)

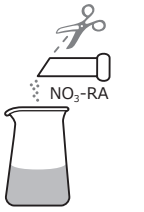

Fig.1


Fig.2

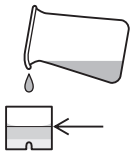
Fig.3

Procedure

1. Press 【NO_3_3】.

2. Press 【OK】 to switch to the photometry window.

3. Put the Cell filled with the pretreated sample in the cell box and press 【Zero】. (Fig.4)

4. Submerge the aperture of the tube in the sample, and the release your finger to suck the whole amount of the sample at once. At the same time, press 【Start】. (Fig.5)

5. Shake the tube in Step 4 by overturning it to right and left for 60 times in 1 minute, and then wait for reaction for about 3 minutes. (Fig.6)

6. Gently return the solution in the tube to the Cell when the time count down reaches under 1 minute, set it again in the cell box. (Fig.7)

7. After 5 minutes have elapsed, the concentration will be automatically displayed.

Fig.4

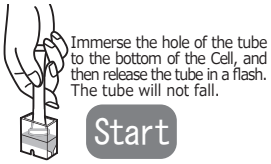

Fig.5

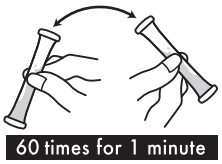

Fig.6

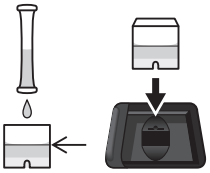
Fig.7

CAUTION

Refer to "NO_3_1 Nitrate (NO_2^- = 0 mg/L)".

NO_3-N Nitrate-Nitrogen

In this analyte the procedure should be divided into 3 methods according to the sample state.
Be careful that each method uses their specified reagent.

1.NO_3-N_1 Nitrate-Nitrogen (NO_2^--N = 0mg/L)

Range : 0.20 — 5.80 mg/L (ppm)
Reagent : WAK-NO_3
Perform the regular Nitrate-Nitrogen measurement procedure.

2.NO_3-N_2 Nitrate-Nitrogen (NO_2^--N ≤ 0.06mg/L)

Range : 0.20 — 5.80 mg/L (ppm)
Reagent : WAK-NO_2, WAK-NO_3
It is necessary to zero adjustment with the color-developed sample with reagent for Nitrite (WAK-NO_2) before the regular Nitrate-Nitrogen measurement procedure.

3.NO_3-N_3 Nitrate-Nitrogen (NO_2^--N 0.06 — 1.5mg/L)

Range : 0.20 — 5.80 mg/L (ppm)
Reagent : Pretreatment reagent (NO_3-RA), WAK-NO_3
It is necessary to remove Nitrite by pretreatment reagent before the regular Nitrate-Nitroegen measurement procedure.

NO_3-N_1　Nitrate-Nitrogen (NO_2^--N = 0mg/L)

Color development: None → Light red → Red
Method　　: Reduction and Naphthylethylenediamine
Range　　: 0.20 — 5.80 mg/L(ppm)
Reagent　　: WAK-NO_3　Tube
Reaction time : 5 minutes after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 539 nm, 580 nm

Procedure

1. Press【NO_3-N_1】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Submerge the aperture of the tube in the sample, and the release your finger to suck the whole amount of the sample at once. At the same time, press【Start】. (Fig.3)
6. Shake the tube in Step 5 by overturning it to right and left for 60 times in 1 minute. (Fig.4)
7. Immediately return the solution in the tube to the Cell in a gentle manner, set it again in the cell box. (Fig.5)
8. After 5 minutes have elapsed, the concentration will be automatically displayed.

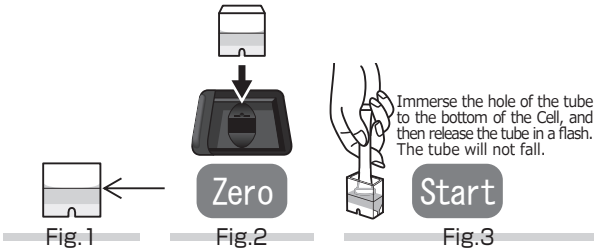

Fig.1　Fig.2　Fig.3

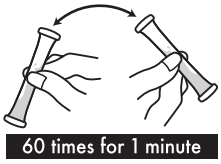

Fig.4

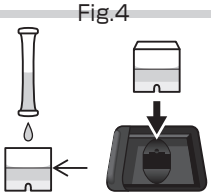
Fig.5

CAUTION

1. The optimum pH during color development is 3. If the pH of the sample is not within the range from 2 to 9, neutralize the sample with dilute sulfuric acid or dilute sodium hydroxide solution, etc.
2. Perform measurement with the sample temperature set to 15 to 30℃ .
3. As the results tend to vary, note the following points to acquire accurate results.
   - To suck the sample into the tube, release your finger while depressing the aperture of the tube against the bottom of the Cell to suck the sample at once.
   - Immediately after having sucked the sample into the tube, start shaking the tube.
   - Shake the tube by overturning it to right and left so that the sample moves all the way to both ends of the tube. Shake the tube for 1 minute (one reciprocation per second).
4. If nitrite ions coexist in the sample, as their color develops stronger than nitrate ions and greatly affects the result, perform measurement by following the procedures.
   "NO_3-N_2　Nitrate-Nitrogen (NO_2^--N ≤ 0.06 mg/L)"
   "NO_3-N_3　Nitrate-Nitrogen (NO_2^--N 0.06 — 1.5 mg/L)"

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

It is not possible to measure seawater.
Oxidizing substance or reductive substance may affect the measurement.

≤ 1000mg/L,: B (Ⅲ) , K^+ , Mg^{2+} , Mn^{2+} , Na^+ , NH_4^+ , PO_4^{3-} , Phenol
≤ 800mg/L,: Cl^-
≤ 200mg/L,: Al^{3+} , Ca^{2+} , F^- , Ni^{2+}
≤ 100mg/L,: CN^- , Fe^{3+}
≤ 50mg/L,: Co^{2+} , Cr^{3+} , Fe^{2+} , Zn^{2+}
≤ 5mg/L,: Ba^{2+} , I^-
≤ 1mg/L,: Cu^{2+} , Mo (Ⅵ) , Sn^{2+} , Residual Chlorine
≤ 0.5mg/L,: Cr (Ⅵ) , SO_3^{2-}
< 1mg/L,: NO_2^-

NO_3-N_2　Nitrate-Nitrogen (NO_2^--N ≤ 0.06mg/L)

Color development : None → Light red → Red
Method : Reduction and Naphthylethylenediamine
Range : 0.20 — 5.80 mg/L(ppm)
Reagent : WAK-NO_2　Tube, WAK-NO_3　Tube
Reaction time : 5 minutes after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 539 nm, 580 nm

Pretreatment method

First, develop the color of nitrite ions.

1. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.1)
2. Suck the whole amount of the sample in the Cell into the tube (WAK-NO_2) and then lightly shake the tube 5 to 6 times. (Fig.2)
3. Return the solution to the Cell and wait for 3 minutes. (Fig.3)

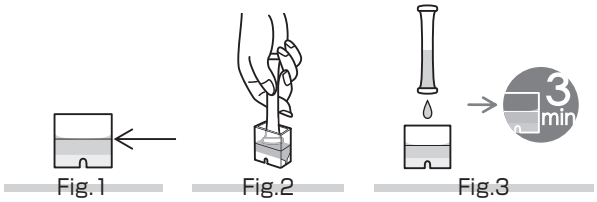

Fig.1　Fig.2　Fig.3

Procedure

1. Press【NO_3-N_2】.
2. Press【OK】to switch to the photometry window.
3. Put the Cell containing color-developed nitrite in the cell box and press【Zero】. (Fig.4)
4. Take the Cell out of the cell box, empty it, and clean it with pure water. (Fig.5)
5. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.6)
6. Submerge the aperture of the tube (WAK-NO_3) in the sample, and the release your finger to suck the whole amount of sample at once. At the same time, press【Start】. (Fig.7)
7. Shake the tube in Step 6 by overturning it to right and left for 60 times in 1 minute. (Fig.8)
8. Return the solution in the tube to the Cell in a gentle manner, set it again in the cell box. (Fig.9)
9. After 5 minutes have elapsed, the concentration will be automatically displayed.

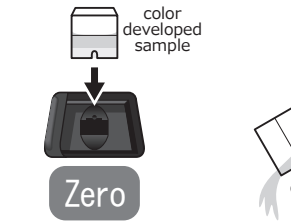

Fig.4

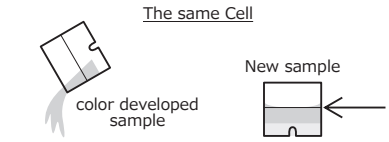

Fig.5　Fig.6

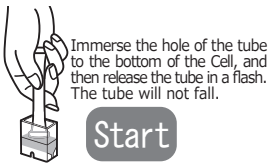

Fig.7

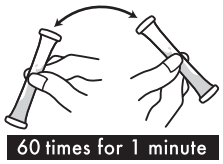

Fig.8

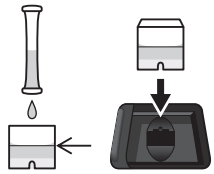
Fig.9

CAUTION

Refer to "NO_3-N_1　Nitrate-Nitrogen (NO_2^--N = 0 mg/L)".

NO_3-N_3　Nitrate-Nitrogen (NO_2^--N 0.06 — 1.5mg/L)

Color development: None → Light red → Red
Method　　: Reduction and Naphthylethylenediamine
Range　　: 0.20 — 5.80 mg/L(ppm)
Reagent　　: Pretreatment reagent (NO_3-RA) (Pack) , WAK-NO_3　Tube
Other Items to Use : Beaker, Heater
Reaction time : 5 minutes after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 539 nm, 580 nm

Pretreatment method

First, remove the nitrite ions mixed in the sample by using pretreatment reagent.

1. Fill a beaker with 30 mL of sample, add pretreatment reagent (NO_3-RA) in the sample, and stir the sample 5 to 6 times. (Fig.1)

2. Heat the sample, boil it for 2 minutes, and cool it down to 15 to 30℃ . (Fig.2)
   If the amount of the sample has decreased after cooling down, add pure water up to 30 mL.

3. Fill the Cell with the pretreated sample for 1.5 mL (up to line). (Fig.3)

Fig.1


Fig.2

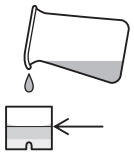
Fig.3

Procedure

1. Press【NO_3-N_3】.

2. Press【OK】to switch to the photometry window.

3. Put the Cell filled with the pretreated sample in the cell box and press【Zero】. (Fig.4)

4. Submerge the aperture of the tube in the sample, and the release your finger to suck the whole amount of the sample at once. At the same time, press【Start】. (Fig.5)

5. Shake the tube in Step 4 by overturning it to right and left for 60 times in 1 minute, and then wait for reaction for about 3 minutes. (Fig.6)

6. Gently return the solution in the tube to the Cell when the time count down reaches under 1 minute, set it again in the cell box. (Fig.7)

7. After 5 minutes have elapsed, the concentration will be automatically displayed.

Fig.4

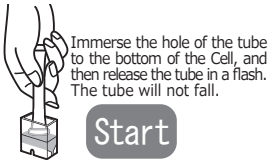

Fig.5

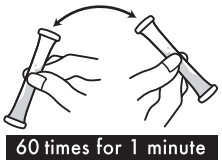

Fig.6

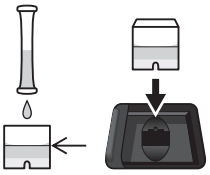
Fig.7

CAUTION

Refer to "NO_3-N_1　Nitrate-Nitrogen (NO_2^--N = 0 mg/L)".

OIL-M　Mineral Oil in Water

Color development: Transparent → White Turbidity
Method　: Oil Concentration-Turbidimetry with PNIPAAm
Range　: 5.0 — 60.0 mg/L(ppm) (resolution : 0.5 mg/L)
Reagent　: WA-OIL-R
Reaction time　: 0 minute
Other Items to Use : Water Analysis Reagent Set: Oil (Model: WA-OIL)
Preparation Procedure : Read the instruction for the reagent (WA-OIL-R).

Cell : PACKTEST Square Cup
Wavelength : 660 nm

Procedure

1. Press【OIL-M】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with pure water (or tap water) for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Take out the Cell, discard the pure water, and fill the same Cell with 1.5mL of the solution prepared using "Water Analysis Reagent Set: Oil". (Fig.3)
6. Set the Cell in the cell box again and press【Start】. (Fig.4)
7. The concentration will be automatically displayed.

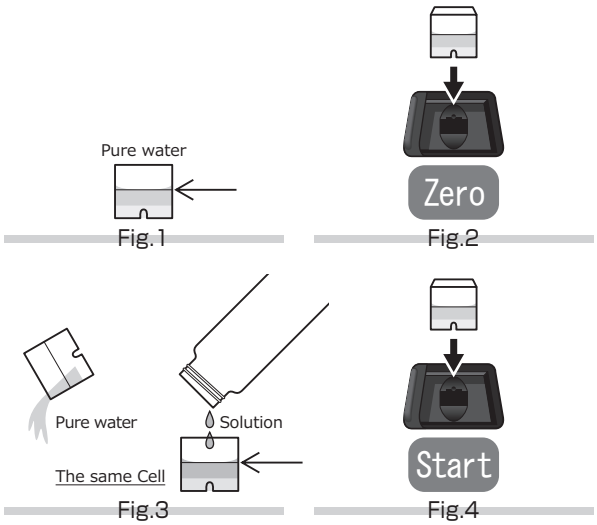

Fig.1　Fig.2　Fig.3　Fig.4

CAUTION

In this method, the concentration of fuel oil A, Engine oil in water is measured.
For notes on the operation, refer to the instruction for the reagent (WA-OIL-R).

OIL-V　Vegetable Oil in Water

Color development: Transparent → White Turbidity
Method　　: Oil Concentration-Turbidimetry with PNIPAAm
Range　　: 5.0 — 60.0 mg/L(ppm) (resolution : 0.5 mg/L)
Reagent　　: WA-OIL-R
Reaction time　: 0 minute
Other Items to Use : Water Analysis Reagent Set: Oil (Model: WA-OIL)
Preparation Procedure : Read the instruction for the reagent (WA-OIL-R).

Cell : PACKTEST Square Cup
Wavelength : 660 nm

Procedure

1. Press【OIL-V】.

2. Press【OK】to switch to the photometry window.

3. Fill the Cell with pure water (or tap water) for 1.5 mL (up to line). (Fig.1)

4. Put the Cell in the cell box and press【Zero】. (Fig.2)

5. Take out the Cell, discard the pure water, and fill the same Cell with 1.5mL of the solution prepared using "Water Analysis Reagent Set: Oil". (Fig.3)

6. Set the Cell in the cell box again and press【Start】. (Fig.4)

7. The concentration will be automatically displayed.

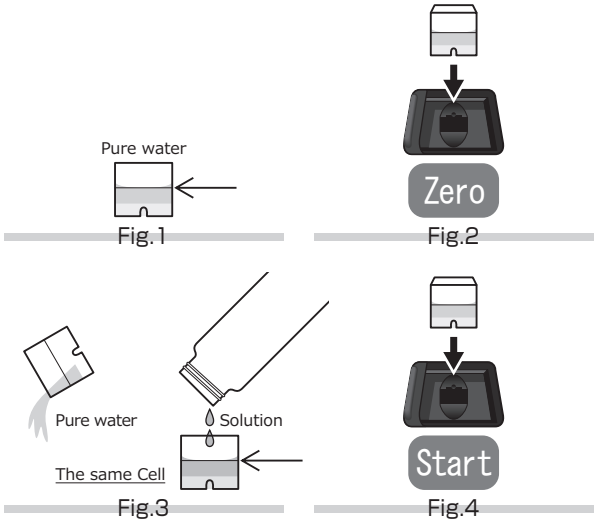

Fig.1　Fig.2
Fig.3　Fig.4

CAUTION

In this method, the concentration of vegetable oil in water is measured.
For notes on the operation, refer to the instruction for the reagent (WA-OIL-R).

OIL-S　Oil in Soil

Color development : Transparent → White Turbidity
Method : Turbidimetry with PNIPAAm Extraction after Ethanol Elution
Range : Fuel oil A　400 — 5000 mg/kg (resolution : 100 mg/kg)
Reagent : SOA-OIL-RR　R-1（Dissolved in Ethanol）, R-2（Liquid）, R-3（Liquid）
Reaction time : 0 minute
Cell : PACKTEST Square Cup
Wavelength : 660 nm
Other Items to Use : Colum(CLM-OIL15,15pc), Bottle(SOA-OIL-BT,15pc), Connector(SOA-OIL-C,1pc)
Preparation Procedure : Read the instruction for the reagent (SOA-OIL-RR).

Procedure

1. Press【OIL-S】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with pure water (or tap water) for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Take out the Cell, discard the pure water, and fill the same Cell with 1.5 mL of the solution prepared using "Soil Screening Refill Reagent Set: Oil". (Fig.3)
6. Set the Cell in the cell box again and press【Start】. (Fig.4)
7. The concentration will be automatically displayed.

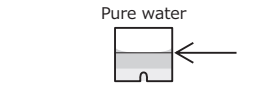

Fig.1

Fig.2

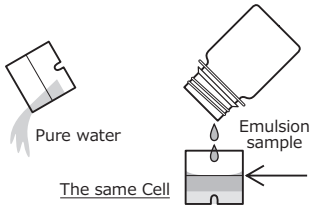

Fig.3

Fig.4

CAUTION

1. In this method, the turbidity of the sample (solution) obtained by the reagent (SOA-OIL-RR) is measured and converted into a fuel oil A value. For notes on the operation, refer to the instruction for the reagent (SOA-OIL-RR).
2. The displayed value is a fuel oil A value and the calibration curve differs depending on the oil type. If contamination by other oil than fuel oil A is anticipated, it is possible to make correction by multiplying the displayed value by any of the coefficients below.
   Engine oil. . . . . displayed value × 0.9
   Fuel oil A . . . . . displayed value × 1.0
   Light oil . . . . . displayed value × 1.0
   Kerosene . . . . . displayed value × 1.5
   Gasoline . . . . . unable to detect
3. The displayed value corresponds to the oil content (mg) per 1 kg of shape-retained soil containing water content.
   To convert to a value per dry weight, separately measure the moisture content and perform correction accordingly.

Pb-SPK　Lead (SPK)

Color development：Yellow → Orange → Red
Method　：Separation and Preconcentration of lead by MetaSEP AnaLig® and 4-(2-Pyridylazo) resorcinol
Range　：0.03 — 0.50 mg/L(ppm)
Reagent　：SPK-Pb　K-1（Liquid）, K-2（Liquid）, K-3（Liquid）, K-4（Liquid）, Tube
Reaction time　：3 minutes after drawing sample into the tube.
Preparation Procedure：Read the instruction for the reagent (SPK-Pb).

Cell：PACKTEST Square Cup
Wavelength：519 nm

Procedure

1. Press【Pb-SPK】.
2. Press【OK】to switch to the photometry window.
3. By following the procedures in 5 "Collection of eluent" in the usage of the reagent (SPK-Pb), take the eluent in the Cell.（Fig.1）
4. Put the Cell in the cell box and press【Zero】.（Fig.2）
5. Suck the whole amount of the eluent in the Cell into the tube and press【Start】at the same time.（Fig.3）
6. Shake the tube in Step 5 about 30 times. If orange lumps are left in the tube, further shake the tube.（Fig.4）
7. Immediately return the solution in the tube to the Cell in a gentle manner, set it again in the cell box.（Fig.5）
8. After 3 minutes have elapsed, the concentration will be automatically displayed.

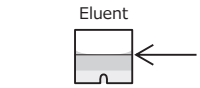

Fig.1

Fig.2

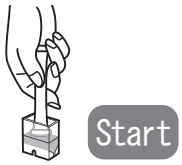

Fig.3

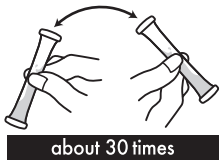

Fig.4

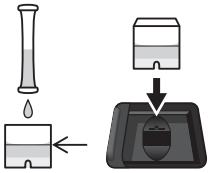
Fig.5

CAUTION

1. In this method, the concentration of the eluent in the reagent (SPK-Pb) is measured. For notes on the operation, refer to the instruction for the reagent (SPK-Pb).
2. If the concentration of lead ions in the sample is considered high or the result is above the measurement range, dilute the sample so that the concentration falls within the measurement range, and perform steps again up to collection of eluent using the reagent (SPK-Pb).
3. Perform measurement with the sample temperature set to 15 to 30℃.
4. Dissolve orange lumps in the tube as much as possible. Undissolved colorless reagent will not affect the measurement.

Influence of coexisting substance

Refer to the instruction for the reagent (SPK-Pb).

Phenol (Reagent Model : WAK-PNL)

Color development: Light yellow → Orange → Red
Method : 4-Aminoantipyrine with enzyme
Range : 0.20 — 5.00 mg/L(ppm)
Reagent : WAK-PNL K-1 (Dropper) , Tube
Reaction time : 8 minutes after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 508 nm

Procedure

1. Press【Phenol】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Add one droplet of K-1 reagent, attach the cap, and shake the Cell 2 to 3 times. (Fig.3)
6. Suck the whole amount of the sample in the Cell into the tube and press【Start】at the same time. (Fig.4)
7. Lightly shake the tube in Step 6 from 5 to 6 times, return the solution in the tube to the Cell in a gentle manner, set it again in the cell box. (Fig.5)
8. After 8 minutes have elapsed, the concentration will be automatically displayed.

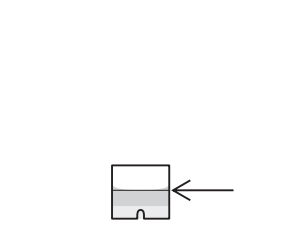
Fig.1

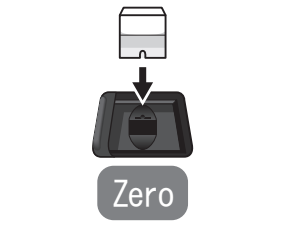

Fig.2

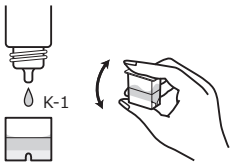

Fig.3

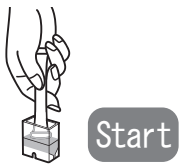

Fig.4

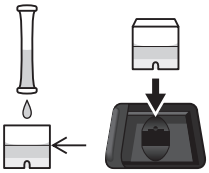
Fig.5

CAUTION

1. **This method is suitable only for WAK-PNL.** When using WAK-PNL-2, refer to the procedures for "Phenol-2".
2. Phenols are classified into phenol and *p*-cresol according to the JIS method, but in this method, the concentration of phenol only is measured. Note that the concentration of *p*-cresol is not measured.
3. The optimum pH during color development is 8. If the pH of the sample is not within the range from 5 to 10, neutralize the sample with dilute sulfuric acid or dilute sodium hydroxide solution, etc.
4. Perform measurement with the sample temperature set to 15 to 30℃ .

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

Seawater does not affect the measurement.
Oxidizing substance or reductive substance may affect the measurement.

≤ 1000mg/L,: B (Ⅲ) , Ba^{2+} , Cl^- , F^- , I^- , K^+ , Mg^{2+} , Na^+ , NO_2^- , NO_3^- , SO_4^{2-} , Zn^{2+}
≤ 500mg/L,: Ca^{2+} , Cd^{2+} , NH_4^+
≤ 200mg/L,: As (Ⅲ) , PO_4^{3-} , Anionic Surfactant
≤ 100mg/L,: Mo (Ⅵ) , SCN^-
≤ 50mg/L,: Ag^+ , Cr (Ⅵ)
≤ 20mg/L,: Co^{2+} , Cr^{3+} , Cu^{2+} , Fe^{3+} , Ni^{2+} , Residual Chlorine
≤ 10mg/L,: Mn^{2+} , SO_3^{2-}
≤ 5mg/L,: CN^- , Pb^{2+}
≤ 1mg/L,: Al^{3+} , Fe^{2+}

Phenol-2 (Reagent Model : WAK-PNL-2)

Color development: Light yellow → Pink → Red
Method : 4-Aminoantipyrine
Range : 0.20 — 5.00 mg/L(ppm)
Reagent : WAK-PNL-2 Tube
Reaction time : 3 minutes after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 525 nm, 670 nm

Procedure

1. Press【Phenol-2】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Suck the whole amount of the sample in the Cell into the tube and press【Start】at the same time. (Fig.3)
6. Lightly shake the tube in Step 6 from 5 to 6 times, return the solution in the tube to the Cell in a gentle manner, set it again in the cell box. (Fig.4)
7. After 3 minutes have elapsed, the concentration will be automatically displayed.

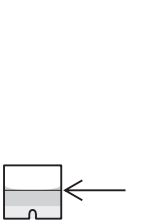
Fig.1

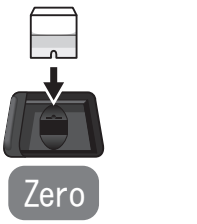

Fig.2

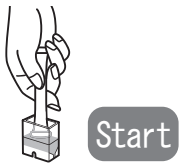

Fig.3

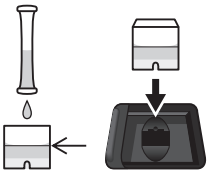
Fig.4

CAUTION

1. **This method is suitable only for WAK-PNL-2.** When using WAK-PNL, refer to the procedures for "Phenol".
2. Phenols are classified into phenol and *p*-cresol according to the JIS method, but in this method, the concentration of phenol only is measured. Note that the concentration of *p*-cresol is not measured.
3. The optimum pH during color development is about 9. If the pH of the sample is not within the range from 4 to 10, neutralize the sample with dilute sulfuric acid or dilute sodium hydroxide solution, etc.
4. Perform measurement with the sample temperature set to 15 to 30℃ .

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

≤ 1000mg/L,: B (Ⅲ) , Ba^{2+} , Br^{-} , Ca^{2+} , Cl^{-} , F^{-} , I^{-} , K^{+} , Mg^{2+} , Mo (Ⅵ) , Na^{+} , NH_4^{+} , NO_2^{-} , NO_3^{-} , PO_4^{3-} , SO_4^{2-} , Zn^{2+} , Non-ionic Surfactant , Cationic Surfactant , EDTA , Citric Acid , Glucose , Sodium Thiosulfate Pentahydrate
≤ 500mg/L,: Al^{3+} , Ascorbic Acid , Anionic Surfactant
≤ 200mg/L,: Ni^{2+} , Hydrogen Peroxide
≤ 100mg/L,: Co^{2+}
≤ 50mg/L,: Fe^{2+} , Fe^{3+}
≤ 20mg/L,: Cr^{3+} , Cu^{2+} , Residual Chlorine
≤ 2mg/L,: Mn^{2+}

Seawater cannot be measured as is.
Please dilute the sample 2-fold or more with pure water, so it will be measurable.
Oxidizing substance or reductive substance may affect the measurement.
Less than 10% of ethanol does not affect the measurement.

PO_4-C　Phosphate (High Range)

Color development: None → Light blue → Blue
Method　　: Molybdenum Blue
Range　　: 2.0 — 50.0 mg/L(ppm)
Reagent　　: WAK-PO_4 (C)　K-1 (Liquid) , Tube
Reaction time : 3 minutes after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 550 nm

Procedure

1. Press【PO_4-C】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 0.2 mL by using the small pipette. (Fig.1)
4. Add the K-1 reagent for 1.5 mL to the sample in the Cell by using the large pipette, attach the cap, and shake the Cell 2 to 3 times. (Fig.2)
5. Remove the cap of the Cell, put the Cell in the cell box and press【Zero】. (Fig.3)
6. Suck the whole amount of the sample in the Cell into the tube and press【Start】at the same time. (Fig.4)
7. Lightly shake the tube in Step 6 from 5 to 6 times, return the solution in the tube to the Cell in a gentle manner, set it again in the cell box. (Fig.5)
8. After 3 minutes have elapsed, the concentration will be automatically displayed.

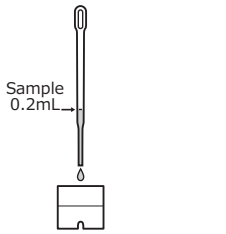

Fig.1

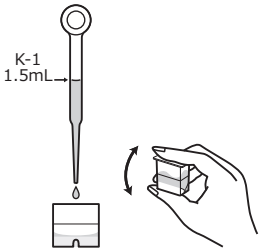

Fig.2

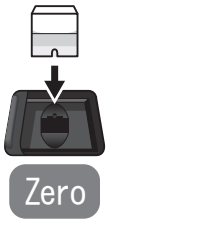

Fig.3

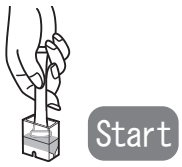

Fig.4

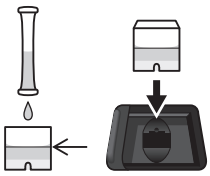
Fig.5

CAUTION

1. In this method, the concentration of ionized phosphate ion(PO_4^{3-}) is measured.
   It is not possible to measure the concentration of hydrolyzable phosphorus and total phosphorus. To measure the concentration of hydrolyzable phosphorus and total phosphorus, conduct pretreatment according to JIS K 0102 46.
2. Use the small pipette for sample after thoroughly cleaning it with pure water or cleaning its inside with the sample.
3. The optimum pH during color development is 1. If the pH of the sample is not within the range from 1 to 9, neutralize the sample with dilute sulfuric acid or dilute sodium hydroxide solution, etc.
4. Perform measurement with the sample and K-1 reagent temperature set to 20℃.
   If their temperature is other than 20℃, multiplying the measurement value by either of the following coefficients can implement correction.
   15℃・・・・・×1.05　　25℃・・・・・×0.95
5. Use of a measuring pipette or the like instead of the supplied pipette enables more accurate measurement.

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

≤ 1000mg/L,: Al^{3+} , B (Ⅲ) , Ca^{2+} , Cl^- , Cr^{3+} , Fe^{2+} , K^+ , Mg^{2+} , Mn^{2+} , Na^+ , NH_4^+ , Ni^{2+} , NO_3^- , SO_4^{2-} , Zn^{2+} , Phenol
≤ 500mg/L,: NO_2^-
≤ 200mg/L,: F^- , Fe^{3+} , Residual Chlorine
≤ 100mg/L,: CN^- , Cr (Ⅵ) , Mo (Ⅵ) , Silica
≤ 10mg/L,: Cu^{2+}
< 1mg/L,: As (Ⅴ) , Ba^{2+}

Seawater does not affect the measurement.

PO_4-P-C　Phosphate-Phosphorus (High Range)

Color development: None → Light blue → Blue
Method　　: Molybdenum Blue
Range　　: 0.7 — 15.0 mg/L(ppm)
Reagent　　: WAK-PO_4 (C)　K-1 (Liquid) , Tube
Reaction time : 3 minutes after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 550 nm

Procedure

1. Press【PO_4-P-C】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 0.2 mL by using the small pipette. (Fig.1)
4. Add the K-1 reagent for 1.5 mL to the sample in the Cell by using the large pipette, attach the cap, and shake the Cell 2 to 3 times. (Fig.2)
5. Remove the cap of the Cell, put the Cell in the cell box and press【Zero】. (Fig.3)
6. Suck the whole amount of the sample in the Cell into the tube and press【Start】at the same time. (Fig.4)
7. Lightly shake the tube in Step 6 from 5 to 6 times, return the solution in the tube to the Cell in a gentle manner, set it again in the cell box. (Fig.5)
8. After 3 minutes have elapsed, the concentration will be automatically displayed.

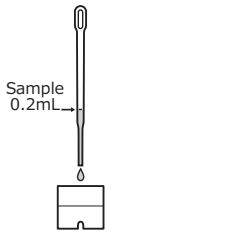

Fig.1

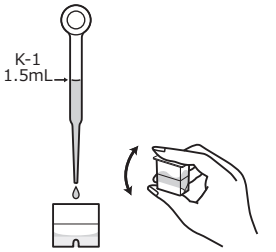

Fig.2

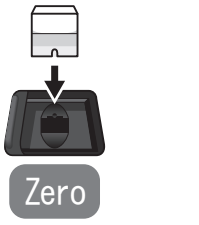

Fig.3

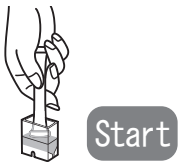

Fig.4

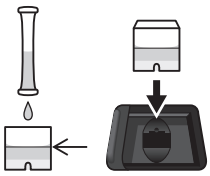
Fig.5

CAUTION

1. In this method, the concentration of ionized phosphate ion(PO_4^{3-}) is measured.
   It is not possible to measure the concentration of hydrolyzable phosphorus and total phosphorus. To measure the concentration of hydrolyzable phosphorus and total phosphorus, conduct pretreatment according to JIS K 0102 46.
2. Use the small pipette for sample after thoroughly cleaning it with pure water or cleaning its inside with the sample.
3. The optimum pH during color development is 1. If the pH of the sample is not within the range from 1 to 9, neutralize the sample with dilute sulfuric acid or dilute sodium hydroxide solution, etc.
4. Perform measurement with the sample and K-1 reagent temperature set to 20℃.
   If their temperature is other than 20℃, multiplying the measurement value by either of the following coefficients can implement correction.
   15℃・・・・・×1.05　　25℃・・・・・×0.95
5. Use of a measuring pipette or the like instead of the supplied pipette enables more accurate measurement.

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

≤ 1000mg/L,: Al^{3+} , B (Ⅲ) , Ca^{2+} , Cl^- , Cr^{3+} , Fe^{2+} , K^+ , Mg^{2+} , Mn^{2+} , Na^+ , NH_4^+ , Ni^{2+} , NO_3^- , SO_4^{2-} , Zn^{2+} , Phenol
≤ 500mg/L,: NO_2^-
≤ 200mg/L,: F^- , Fe^{3+} , Residual Chlorine
≤ 100mg/L,: CN^- , Cr (Ⅵ) , Mo (Ⅵ) , Silica
≤ 10mg/L,: Cu^{2+}
< 1mg/L,: As (Ⅴ) , Ba^{2+}

Seawater does not affect the measurement.

PO_4 Phosphate

Color development: None → Light blue → Blue
Method : Molybdenum Blue
Range : 0.10 — 5.00 mg/L(ppm)
Reagent : WAK-PO_4 K-1 (Dropper) , Tube
Reaction time : 3 minutes after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 650 nm, 580 nm

Procedure

1. Press【PO_4】.
2. Press【OK】to switch to the photometry window
3. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Add four droplets of K-1 reagent, attach the cap, and shake the Cell 2 to 3 times. (Fig.3)
6. Suck the whole amount of the sample in the Cell into the tube and press【Start】at the same time. (Fig.4)
7. Lightly shake the tube in Step 6 from 5 to 6 times, return the solution in the tube to the Cell in a gentle manner, set it again in the cell box. (Fig.5)
8. After 3 minutes have elapsed, the concentration will be automatically displayed.

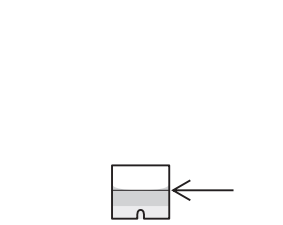
Fig.1

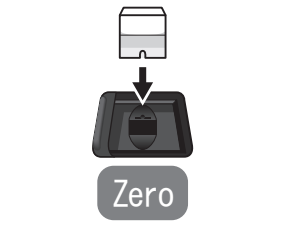

Fig.2

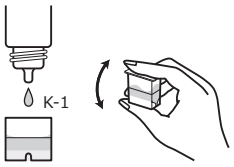

Fig.3

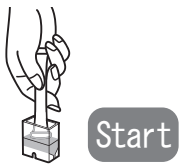

Fig.4

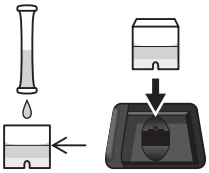
Fig.5

CAUTION

1. In this method, the concentration of ionized phosphoric acid (PO_4^{3-}) in the sample is measured.
   It is not possible to measure the concentration of hydrolyzable phosphorus and total phosphorus. To measure the concentration of hydrolyzable phosphorus and total phosphorus, conduct pretreatment according to JIS K 0102 46 or refer to "TP Total Phosphorus".
2. The optimum pH during color development is 1. If the pH of the sample is not within the range from 1 to 9, neutralize the sample with dilute sulfuric acid or dilute sodium hydroxide solution, etc.
3. Perform measurement with the sample temperature set to 20℃ .
   If the sample temperature is other than 20 ℃ , multiplying the measurement value by either of the following coefficients can implement correction.
   15℃・・・・・×1.05 25℃・・・・・×0.95

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

≤ 1000mg/L,: B (Ⅲ) , Cl^- , CN^- , K^+ , Na^+ , NH_4^+ , NO_3^- , SO_4^{2-} , Zn^{2+}
≤ 800mg/L,: Al^{3+} , Mn^{2+}
≤ 500mg/L,: Mg^{2+} , NO_2^-
≤ 100mg/L,: Cr^{3+} , Fe^{2+} , Fe^{3+} , Ni^{2+} , Silica , Phenol
≤ 50mg/L,: Co^{2+} , Cu^{2+} , F^- , I^- , Residual Chlorine
≤ 20mg/L,: Ca^{2+} , Cr (Ⅵ) , Mo (Ⅵ)
< 1mg/L,: As (Ⅴ) , Ba^{2+}

Seawater cannot be measured as is.
Please dilute the sample 5-fold or more with pure water, so it will be measurable.

PO_4-P　Phosphate-Phosphorus

Color development: None → Light blue → Blue
Method　　: Molybdenum Blue
Range　　: 0.03 — 1.50 mg/L(ppm)
Reagent　　: WAK-PO_4　K-1（Dropper）, Tube
Reaction time : 3 minutes after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 650 nm, 580 nm

Procedure

1. Press【PO_4-P】.
2. Press【OK】to switch to the photometry window
3. Fill the Cell with the sample for 1.5 mL (up to line).（Fig.1）
4. Put the Cell in the cell box and press【Zero】.（Fig.2）
5. Add four droplets of K-1 reagent, attach the cap, and shake the Cell 2 to 3 times.（Fig.3）
6. Suck the whole amount of the sample in the Cell into the tube and press【Start】at the same time.（Fig.4）
7. Lightly shake the tube in Step 6 from 5 to 6 times, return the solution in the tube to the Cell in a gentle manner, set it again in the cell box.（Fig.5）
8. After 3 minutes have elapsed, the concentration will be automatically displayed.

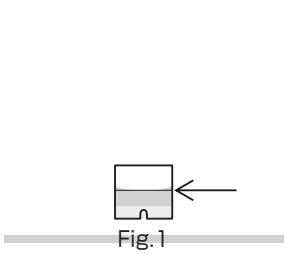
Fig.1

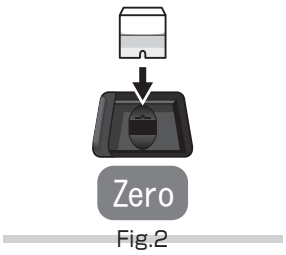

Fig.2

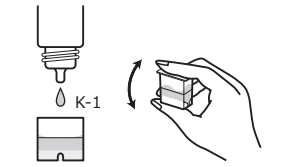

Fig.3

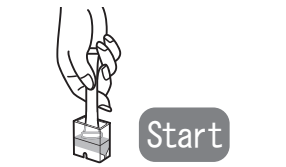

Fig.4

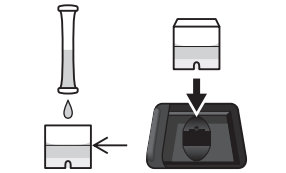
Fig.5

CAUTION

1. In this method, the concentration of ionized phosphoric acid (PO_4^{3-}) in the sample is measured.
   It is not possible to measure the concentration of hydrolyzable phosphorus and total phosphorus. To measure the concentration of hydrolyzable phosphorus and total phosphorus, conduct pretreatment according to JIS K 0102 46 or refer to "TP　Total Phosphorus".
2. The optimum pH during color development is 1. If the pH of the sample is not within the range from 1 to 9, neutralize the sample with dilute sulfuric acid or dilute sodium hydroxide solution, etc.
3. Perform measurement with the sample temperature set to 20℃.
   If the sample temperature is other than 20 ℃, multiplying the measurement value by either of the following coefficients can implement correction.
   15℃・・・・・×1.05　　25℃・・・・・×0.95

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

≦ 1000mg/L,: B (Ⅲ), Cl^-, CN^-, K^+, Na^+, NH_4^+, NO_3^-, SO_4^{2-}, Zn^{2+}
≦ 800mg/L,: Al^{3+}, Mn^{2+}
≦ 500mg/L,: Mg^{2+}, NO_2^-
≦ 100mg/L,: Cr^{3+}, Fe^{2+}, Fe^{3+}, Ni^{2+}, Silica, Phenol
≦ 50mg/L,: Co^{2+}, Cu^{2+}, F^-, I^-, Residual Chlorine
≦ 20mg/L,: Ca^{2+}, Cr (Ⅵ), Mo (Ⅵ)
< 1mg/L,: As (Ⅴ), Ba^{2+}

Seawater cannot be measured as is.
Please dilute the sample 5-fold or more with pure water, so it will be measurable.

PO_4-D　Phosphate (Low Range)

Color development: None → Light purple → Purple
Method　　: 4-Aminoantipyrine with enzyme
Range　　: 0.10 — 3.00 mg/L (ppm)
Reagent　　: WAK-PO_4 (D)　Tube
Reaction time : 5 minutes after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 540 nm, 570 nm

Procedure

1. Press【PO_4-D】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Suck the whole amount of the sample in the Cell into the tube and press【Start】at the same time. (Fig.3)
6. Lightly shake the tube in Step 5 from 5 to 6 times, return the solution in the tube to the Cell in a gentle manner, set it again in the cell box. (Fig.4)
7. After 5 minutes have elapsed, the concentration will be automatically displayed.

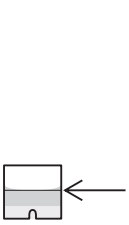
Fig.1

Fig.2

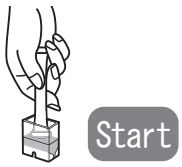

Fig.3

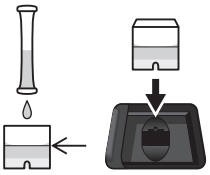
Fig.4

CAUTION

1. In this method, the concentration of ionized phosphate ion(PO_4^{3-}) is measured.
   It is not possible to measure the concentration of hydrolyzable phosphorus and total phosphorus. To measure the concentration of hydrolyzable phosphorus and total phosphorus, conduct pretreatment according to JIS K 0102 46.
2. The optimum pH during color development is 7. If the pH of the sample is not within the range from 6 to 9, neutralize the sample with dilute sulfuric acid or dilute sodium hydroxide solution, etc.
3. Perform measurement with the sample temperature set to 15 to 30℃ .

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

It is not possible to measure seawater.
Oxidizing substance such as hydrogen peroxide and residual chlorine may cause a positive measurement error.
Reductive substance may cause a negative measurement error.

≤ 1000mg/L,: Ba^{2+} , Ca^{2+}, Cl^- , F^- , I^- , K^+ , Na^+ , NH_4^+ , NO_2^- , NO_3^-
≤ 500mg/L,: B (Ⅲ)
≤ 250mg/L,: Phenol
≤ 100mg/L,: Zn^{2+}
≤ 50mg/L,: Cu^{2+} , Ni^{2+} , SO_4^{2-}
≤ 20mg/L,: Mg^{2+}
≤ 10mg/L,: Al^{3+} , Cr^{3+} , Cr (Ⅵ)
≤ 5mg/L,: Fe^{3+} , Mn^{2+}
≤ 1mg/L,: CN^-
< 1mg/L,: Fe^{2+} , Residual Chlorine

PO_4-P-D　Phosphate-Phosphorus (Low Range)

Color development: None → Light purple → Purple
Method　　: 4-Aminoantipyrine with enzyme
Range　　: 0.03 — 1.00 mg/L(ppm)
Reagent　　: WAK-PO_4 (D)　Tube
Reaction time : 5 minutes after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 540 nm, 570 nm

Procedure

1. Press【PO_4-P-D】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Suck the whole amount of the sample in the Cell into the tube and press【Start】at the same time. (Fig.3)
6. Lightly shake the tube in Step 5 from 5 to 6 times, return the solution in the tube to the Cell in a gentle manner, set it again in the cell box. (Fig.4)
7. After 5 minutes have elapsed, the concentration will be automatically displayed.

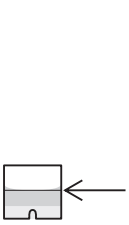
Fig.1

Fig.2

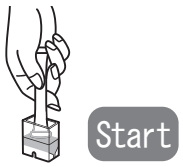

Fig.3

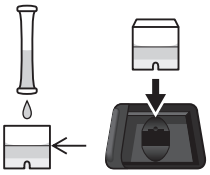
Fig.4

CAUTION

1. In this method, the concentration of ionized phosphate ion(PO_4^{3-}) is measured.
   It is not possible to measure the concentration of hydrolyzable phosphorus and total phosphorus. To measure the concentration of hydrolyzable phosphorus and total phosphorus, conduct pretreatment according to JIS K 0102 46.
2. The optimum pH during color development is 7. If the pH of the sample is not within the range from 6 to 9, neutralize the sample with dilute sulfuric acid or dilute sodium hydroxide solution, etc.
3. Perform measurement with the sample temperature set to 15 to 30℃ .

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

It is not possible to measure seawater.
Oxidizing substance such as hydrogen peroxide and residual chlorine may cause a positive measurement error.
Reductive substance may cause a negative measurement error.

≤ 1000mg/L,: Ba^{2+} , Ca^{2+}, Cl^- , F^- , I^- , K^+ , Na^+ , NH_4^+ , NO_2^- , NO_3^-
≤ 500mg/L,: B (Ⅲ)
≤ 250mg/L,: Phenol
≤ 100mg/L,: Zn^{2+}
≤ 50mg/L,: Cu^{2+} , Ni^{2+} , SO_4^{2-}
≤ 20mg/L,: Mg^{2+}
≤ 10mg/L,: Al^{3+} , Cr^{3+} , Cr (Ⅵ)
≤ 5mg/L,: Fe^{3+} , Mn^{2+}
≤ 1mg/L,: CN^-
< 1mg/L,: Fe^{2+} , Residual Chlorine

S　Sulfide (Hydrogen Sulfide)

Color development : None → Light blue → Blue
Method : Methylene blue Method
Range : 0.05 — 0.80 mg/L(ppm)
Reagent : WAK-S　K-1 (Dropper) , Tube
Reaction time : 3 minutes after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 670 nm, 620 nm

Procedure

1. Press【S】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Add two droplets of K-1 reagent. (Fig.3)
6. Immediately suck the whole amount of the sample in the Cell into the tube and press【Start】at the same time. (Fig.4)
7. Lightly shake the tube in Step 6 from 5 to 6 times, return the solution in the tube to the Cell in a gentle manner, set it again in the cell box. (Fig.5)
8. After 3 minutes have elapsed, the concentration will be automatically displayed.

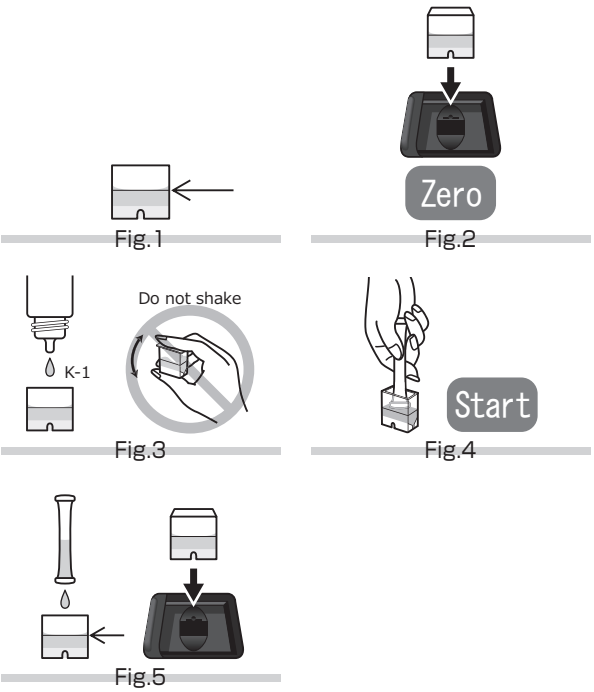

Fig.1　Fig.2　Fig.3　Fig.4　Fig.5

CAUTION

1. In this method, the concentration of sulfur in the hydrogen sulfide (H_2S), ionized hydrogen sulfide (HS^-) and sulfide ion (S^{2-}) states is measured. It is not possible to measure the concentration of sulfuric acid and sulfurous acid.
2. In the case where the sulfide existing in the sample is considered sulfide ions (S^{2-}) only, the obtained result can be converted into the concentration of hydrogen sulfide by multiplying it by 1.06.
3. The optimum pH during color development is 2. If the pH of the sample is not within the range from 2 to 9, neutralize the sample with dilute sulfuric acid or dilute sodium hydroxide solution, etc.
4. Perform measurement with the sample temperature set to 15 to 30℃ .

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

Seawater does not affect the measurement.
Oxidizing substance or reductive substance may affect the measurement.
If metallic ions are mixed with sulfide ions, metallic sulfide is produced and it cannot be detected as sulfide ions any longer. In this case, perform separation of metallic sulfide by referring to the JIS method or others.

Except for Heavy metal ions:

≤ 100mg/L,: B (Ⅲ) , Ca^{2+} , Cl^- , F^- , K^+ , Mg^{2+} , Na^+ , NH_4^+ , NO_3^- , PO_4^{3-} , SO_4^{2-} , Phenol , Anionic Surfactant
≤ 10mg/L,: I^-
≤ 1mg/L,: NO_2^- , SO_3^{2-}
< 1mg/L,: Residual Chlorine

Heavy metal ions:

≤ 10mg/L,: Al^{3+} , Ba^{2+} , CN^- , Co^{2+} , Cr^{3+} , Fe^{2+} , Fe^{3+} , Ni^{2+} , Zn^{2+}
≤ 5mg/L,: Mn^{2+} , Mo (Ⅵ)
≤ 1mg/L,: Cr (Ⅵ)
< 1mg/L,: Cu^{2+}

SiO_2 Silica

Color development: None → Light blue → Blue
Method : Molybdenum Blue
Range : 3.0 — 60.0 mg/L(ppm)
Reagent : WAK-SiO_2 Distilled water, K-1 (Dropper) , K-2 (Dropper) , Tube
Reaction time : 5 minutes after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 650 nm, 560 nm

Procedure

1. Press【SiO_2】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 0.2 mL by using the small pipette. (Fig.1)
4. Add the Water for Dilution for 1.5 mL to the sample in the Cell by using the large pipette, attach the cap, and shake the Cell 2 to 3 times. (Fig.2)
5. Remove the cap of the Cell, put the Cell in the cell box and press【Zero】. (Fig.3)
6. Add two droplets of K-1 reagent, attach the cap, shake the Cell 2 to 3 times, and leave for 3 minutes. (Fig.4)
7. Add one droplet of K-2 reagent, attach the cap, shake the Cell 2 to 3 times, and leave for 30 seconds. (Fig.5)
8. Suck the whole amount of the sample in the Cell into the tube and press【Start】at the same time. (Fig.6)
9. Lightly shake the tube in Step 8 from 5 to 6 times, return the solution in the tube to the Cell in a gentle manner, set it again in the cell box. (Fig.7)
10. After 5 minutes have elapsed, the concentration will be automatically displayed.

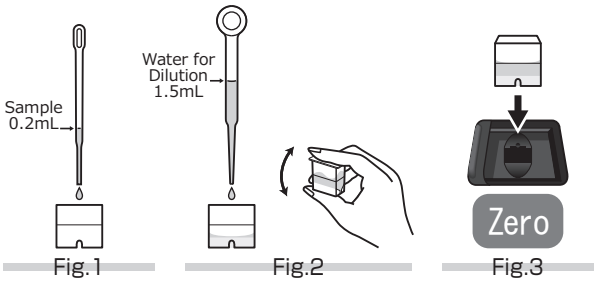

Fig.1 Fig.2 Fig.3

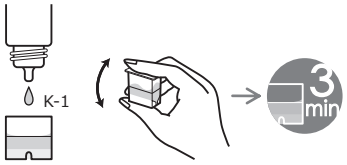

Fig.4

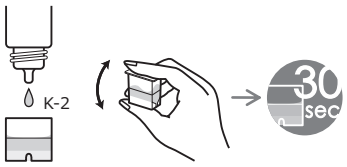

Fig.5

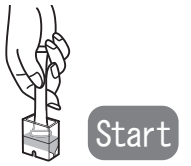

Fig.6

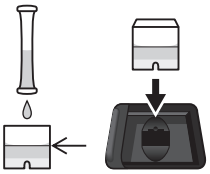
Fig.7

CAUTION

1. While silica is classified into ionized silica, dissolved and colloidal silica and total silica and each of them is displayed as silicon dioxide (SiO_2), in this method, the concentration of ionized silica (SiO_3^{2-}) is measured. To measure the dissolved and colloidal silica and total silica, perform measurement after pretreatment of the respective measurement targets according to JIS K 0101 44.2 or 44.3.
2. Use the small pipette for sample after thoroughly cleaning it with pure water or cleaning its inside with the sample.
3. The optimum pH during color development is 2. If the pH of the sample is not within the range from 2 to 9, neutralize the sample with dilute sulfuric acid or dilute sodium hydroxide solution, etc.
4. Perform measurement with the temperatures of the sample and dilution water set to 15 to 30℃ .
5. Use of a measuring pipette or the like instead of the supplied pipette enables more accurate measurement.

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

Seawater does not affect the measurement.
Oxidizing substance or reductive substance may affect the measurement.
Even a tiny amount of hydrogen sulfide may obstruct the measurement. If hydrogen sulfide is considered to coexist, acidify and boil the sample to remove hydrogen sulfide before performing measurement.

≤ 5000mg/L,: Al^{3+} , B (Ⅲ) , Ca^{2+} , Cl^- , CN^- , Co^{2+} , Fe^{2+} , I^- , K^+ , Mg^{2+} , Mn^{2+} , Mo (Ⅵ) , Na^+ , NH_4^+ , Ni^{2+} , NO_3^- , SO_4^{2-} , Zn^{2+} , Anionic Surfactant , Residual Chlorine , Phenol , Formaldehyde
≤ 1000mg/L,: Cr (Ⅵ) , Cu^{2+} , F^- , Fe^{3+} , NO_2^-
≤ 500mg/L,: PO_4^{3-}
≤ 100mg/L,: Ba^{2+} , Cr^{3+}
≤ 50mg/L,: V (Ⅴ)

SiO_2-D　Silica (Low Range)

Color development : None → Light blue → Blue
Method : Molybdenum Blue
Range : 0.30 — 7.00 mg/L(ppm)
Reagent : WAK-SiO_2 (D)　K-1 (Dropper) , K-2 (Dropper) , Tube
Reaction time : 5 minutes after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 650 nm, 560 nm

Procedure

1. Press【SiO_2-D】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Add two droplets of K-1 reagent, attach the cap, shake the Cell 2 to 3 times, and leave for 3 minutes. (Fig.3)
6. Add one droplet of K-2 reagent, attach the cap, shake the Cell 2 to 3 times, and leave for 30 seconds. (Fig.4)
7. Suck the whole amount of the sample in the Cell into the tube and press【Start】at the same time. (Fig.5)
8. Lightly shake the tube in Step 7 from 5 to 6 times, return the solution in the tube to the Cell in a gentle manner, set it again in the cell box. (Fig.6)
9. After 5 minutes have elapsed, the concentration will be automatically displayed.

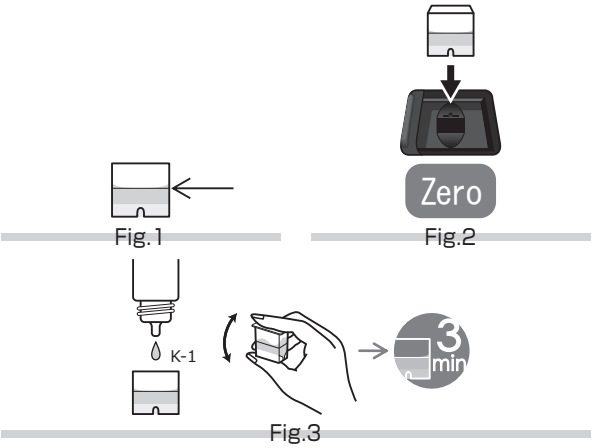

Fig.1　Fig.2　Fig.3　Fig.4　Fig.5　Fig.6

CAUTION

1. While silica is classified into ionized silica, dissolved and colloidal silica and total silica and each of them is displayed as silicon dioxide (SiO_2), in this method, the concentration of ionized silica (SiO_3^{2-}) is measured. To measure the dissolved and colloidal silica and total silica, perform measurement after pretreatment of the respective measurement targets according to JIS K 0101 44.2 or 44.3.
2. The optimum pH during color development is 2. If the pH of the sample is not within the range from 2 to 9, neutralize the sample with dilute sulfuric acid or dilute sodium hydroxide solution, etc.
3. Perform measurement with the temperatures of the sample and dilution water set to 15 to 30℃ .

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

Seawater does not affect the measurement.
Oxidizing substance or reductive substance may affect the measurement.
Even a tiny amount of hydrogen sulfide may obstruct the measurement. If hydrogen sulfide is considered to coexist, acidify and boil the sample to remove hydrogen sulfide before performing measurement.

≤ 1000mg/L,: Al^{3+} , B (Ⅲ) , Ca^{2+} , Cl^- , CN^- , Co^{2+} , Fe^{2+} , I^- , K^+ , Mg^{2+} , Mn^{2+} , Mo (Ⅵ) , Na^+ , NH_4^+ , Ni^{2+} , NO_3^- , SO_4^{2-} , Zn^{2+} , Anionic Surfactant , Residual Chlorine , Phenol , Formaldehyde
≤ 500mg/L,: NO_2^-
≤ 200mg/L,: Cr (Ⅵ)
≤ 100mg/L,: Cu^{2+} , F^- , Fe^{3+}
≤ 50mg/L,: PO_4^{3-}
≤ 10mg/L,: Ba^{2+} , Cr^{3+} , V (Ⅴ)

SO_4 Sulfate

Color development: Transparent → White Turbidity
Method : Barium sulfate turbidimetry
Range : 5 — 100 mg/L(ppm)
Reagent : DPR—SO4 R—A (Dropper) , R-1 (Dropper) , R-2 (Dropper)
Reaction time : 3 minutes after R-2 reagent is added.

Cell : PACKTEST Square Cup
Wavelength : 615 nm

Procedure

1. Press 【SO_4】.
2. Press 【OK】 to switch to the photometry window.
3. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.1)
4. Add one droplet of the R-A reagent, attach the cap, and shake the Cell 2 to 3 times. (Fig.2)
5. Add one droplet of the R-1 reagent after shaking it intensely, attach the cap, and shake the Cell 2 to 3 times. (Fig.3)
6. Remove the cap of the Cell, put the Cell in the cell box and press 【Zero】. (Fig.4)
7. Add one droplet of the R-2 reagent, attach the cap, shake the Cell 30 times or more in 10 seconds, and press 【Start】. (Fig.5)
8. Remove the cap of the Cell, set the Cell in the cell box again. (Fig.6)
9. After 3 minutes have elapsed, the concentration will be automatically displayed.

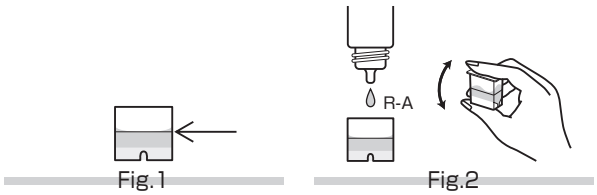

Fig.1 Fig.2

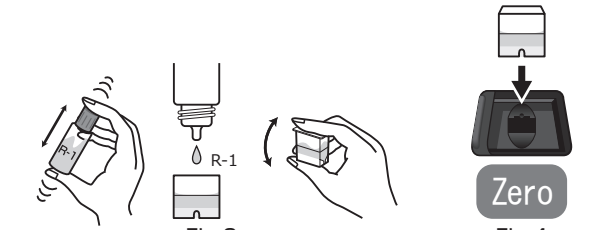

Fig.3 Fig.4

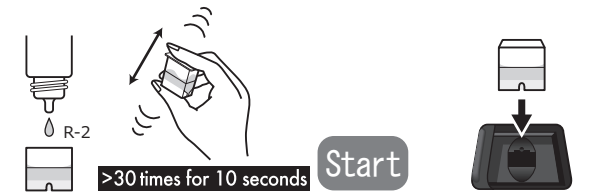

Fig.5 Fig.6

CAUTION

1. In this method, the concentration of ionized sulfuric acid (SO_4^{2-}) is measured.
2. The optimum pH during color development is about 2. If the pH of the sample is not within the range from 2 to 9, neutralize the sample with dilute hydrochloric acid or dilute sodium hydroxide solution, etc. (Do not use sulfuric acid.)
3. Perform measurement with the sample temperature set to 20 to 30℃ .
4. Depending on the operation method, the results vary. In Step 7 of "Procedure", shake the Cell in a constant manner. If the Cell is shaken gently, the measurement value tends to be low. If the Cell is shaken intensely, the measurement value tends to be high.
5. To set the Cell in the cell box, remove the cap. Wipe off water droplets before setting the Cell in the cell box.
6. As turbid substances attach to the Cell after measurement, thoroughly clean the Cell.

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

It is possible to measure seawater, but as it has a high concentration of sulfate ions, dilution is necessary. (Approximately 100 times in the case of artificial seawater)
Substances such as sulfite ions and thiosulfuric acid ions turn into sulfate ions and are measured depending on their oxidation state.
If anions that cause production of insoluble barium salt are contained under the acid condition, measurement is not possible.

Except for Heavy metal ions:

≤ 1000mg/L,: B (Ⅲ) , Ca^{2+} , Cl^- , F^- , K^+ , Na^+ , NH_4^+ , NO_2^- , NO_3^- , Phenol
≤ 500mg/L,: PO_4^{3-}
≤ 200mg/L,: Residual Chlorine
< 1mg/L,: Anionic Surfactant

Heavy metal ions:

≤ 200mg/L,: Fe^{3+}
≤ 100mg/L,: Cr (Ⅵ)
≤ 20mg/L,: Al^{3+}

TH　Total Hardness

Color development: Light purple → Purple
Method　　: Phthalein Complexone
Range　　: 10 — 150 mg/L(ppm)
Reagent　　: WAK-TH　Tube
Reaction time　: 1 minute after drawing sample into the tube.

Cell：PACKTEST Square Cup
Wavelength：569 nm, 550 nm, 670 nm

Procedure

1. Press【TH】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Suck the whole amount of the sample in the Cell into the tube and press【Start】at the same time. (Fig.3)
6. Shake the tube in Step 5 about 10 times. (If the reagent is left in the tube, further shake the tube.) (Fig.4)
7. Gently return the solution in the tube to the Cell, set it again in the cell box. (Fig.5)
8. After 1 minutes have elapsed, the concentration will be automatically displayed.

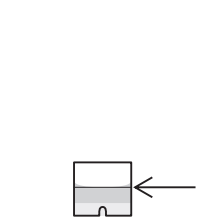
Fig.1

Fig.2

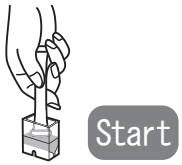

Fig.3

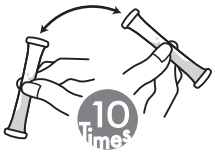

Fig.4

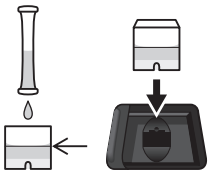
Fig.5

CAUTION

1. In this method, a sample having the ratio between calcium hardness and magnesium hardness of 2:1 to 3:1 can be measured. The calibration curve has been created using 2.5:1 as the standard solution.
2. A sample with a higher percentage of calcium hardness produces a higher result, and a sample with a higher percentage of magnesium hardness produces a lower result.
3. If the total hardness value in the sample is 10 mg/L or less, color development will occur, but the result will be displayed as "UNDER".
4. The optimum pH during color development is 10. If the pH of the sample is not within the range from 5 to 10, neutralize the sample with dilute sulfuric acid or dilute sodium hydroxide solution, etc.
5. Perform measurement with the sample temperature set to 15 to 30℃ .

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

It is not possible to measure seawater.

≤ 1000mg/L,: Cl^- , K^+ , Na^+ , NH_4^+ , NO_2^- , NO_3^- , PO_4^{3-} , SO_4^{2-} ,
Anionic Surfactant , Phenol
≤ 100mg/L,: B (Ⅲ) , F^- , I^- , Silica
≤ 50mg/L,: Ba^{2+}
≤ 10mg/L,: CN^- , Mo (Ⅵ)
≤ 5mg/L,: Al^{3+}
≤ 1mg/L,: Co^{2+} , Cr (Ⅵ) , Ni^{2+} , Residual Chlorine
< 1mg/L,: Cr^{3+} , Cu^{2+} , Fe^{2+} , Fe^{3+} , Mn^{2+} , Zn^{2+}

TN-2　Total Nitrogen

Color development : Light red → Red
Method : Decomposition by Potassium Peroxodisulfate under Alkaline Condition + Reduction and Naphthylethylenediamine
Range : 0.5 — 7.0 mg/L (ppm)
Reagent : TNP-N-R
Reaction time : 5 minutes after drawing sample into the tube.
Other Items to Use : Mini Autoclave Set (Model: TNP-MAS), Heater
Preparation Procedure : Read the instruction for the reagent (TNP-N-R).

Cell : PACKTEST Square Cup
Wavelength : 539 nm, 580 nm

Procedure

1. Press【TN-2】.
2. Press【OK】to switch to the photometry window.
3. Take the whole amount of the pretreated sample cooled to 20℃ in the Cell, and add two droplets of R-3 reagent, attach the cap, and shake the Cell 2 to 3 times. (Fig.1)
4. Remove the cap of the Cell, put the Cell in the cell box and press【Zero】. (Fig.2)
5. Submerge the aperture of the tube in the sample, and the release your finger to suck the whole amount of the sample at once. At the same time, press【Start】. (Fig.3)
6. Shake the tube in Step 5 by overturning it to right and left for 60 times in 1 minute. (Fig.4)
7. Immediately return the solution in the tube to the Cell in a gentle manner, set it again in the cell box. (Fig.5)
8. After 5 minutes have elapsed, the concentration will be automatically displayed.

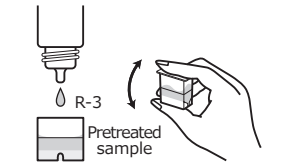

Fig.1

Fig.2

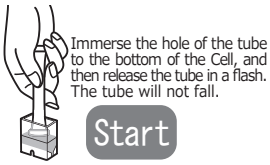

Fig.3

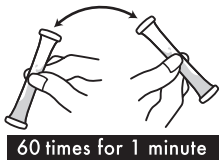

Fig.4

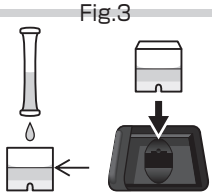
Fig.5

CAUTION

1. In this method, the concentration of nitrogen in the form of ionized nitrate ion (NO_3^-) in the pretreated sample is measured.
2. After the pretreated sample has been cooled down to 20℃ , conduct the measurement.

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

Measure seawater after diluting it by 10 times and pretreatment it.
Oxidizing substance or reductive substance may affect the measurement. (However, in this measurement method, reductive substances are not considered left in the pretreated sample.)

≤ 1000mg/L,: B (Ⅲ) , K^+ , Mg^{2+} , Na^+ , PO_4^{3-} , Phenol
≤ 200mg/L,: Al^{3+} , Ca^{2+} , F^- , Ni^{2+}
≤ 100mg/L,: Fe^{3+}
≤ 50mg/L,: Co^{2+} , Zn^{2+}
≤ 5mg/L,: Ba^{2+}
≤ 1mg/L,: Cu^{2+} , Mo (Ⅵ)
≤ 0.5mg/L,: Cr (Ⅵ)

TP-2　Total Phosphorus

Color development : None → Light blue → Blue
Method : Decomposition by Potassium Peroxodisulfate under Acid Condition + Molybdenum blue
Range : 0.10 — 2.00 mg/L (ppm)
Reagent : TNP-P-R
Reaction time : 3 minutes after drawing sample into the tube.
Other Items to Use : Mini Autoclave Set (Model: TNP-MAS), Heater
Preparation Procedure : Read the instruction for the reagent (TNP-P-R).

Cell : PACKTEST Square Cup
Wavelength : 650 nm, 580 nm

Procedure

1. Press【TP-2】.
2. Press【OK】to switch to the photometry window
3. Take the whole amount of the pretreated sample cooled to 20℃ in the Cell. (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Add four droplets of R-3 reagent, attach the cap, and shake the Cell 2 to 3 times. (Fig.3)
6. Suck the whole amount of the sample in the Cell into the tube and press【Start】at the same time. (Fig.4)
7. Lightly shake the tube in Step 6 from 5 to 6 times, return the solution in the tube to the Cell in a gentle manner, set it again in the cell box. (Fig.5)
8. After 3 minutes have elapsed, the concentration will be automatically displayed.

Fig.1

Fig.2

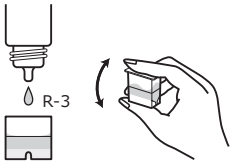

Fig.3

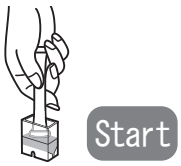

Fig.4

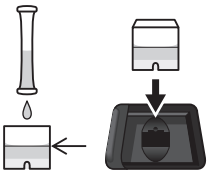
Fig.5

CAUTION

1. In this method, the concentration of ionized phosphoric acid (PO_4^{3-}) in the pretreated sample is measured.
2. After the pretreated sample has been cooled down to 20℃ , conduct the measurement.
   When its temperature is between 30℃ to 40℃ , an approximate result can be obtained by multiplying the measurement value by 0.8.

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

≤ 1000mg/L,: B (Ⅲ) , Cl^- , CN^- , K^+ , Na^+ , NO_3^- , SO_4^{2-} , Zn^{2+}
≤ 800mg/L,: Al^{3+}
≤ 500mg/L,: Mg^{2+}
≤ 100mg/L,: Fe^{3+} , Ni^{2+} , Silica
≤ 50mg/L,: Co^{2+} , Cu^{2+} , F^-
≤ 20mg/L,: Ca^{2+} , Cr (Ⅵ) , Mo (Ⅵ)
< 1mg/L,: As (Ⅲ) , Ba^{2+}

Seawater does not affect the measurement.

Turbid-F　Turbidity (Formazine)

Measurement of turbidity of sample
Calibration　　: Formazine Turbidity standard solution
Measurement range : 10 to 400 deg.
Reagent　　: not used
Measurement time : 0 minute

Cell : PACKTEST Square Cup
Wavelength : 660 nm

Procedure

1. Press【Turbid-F】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with pure water for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Take out the Cell, discard the pure water, fill the same Cell with 1.5 mL of sample. (Fig.3)
6. Set the Cell in the cell box again and press【Start】. (Fig.4)
7. The Turbidity will be automatically displayed.

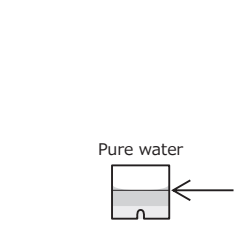

Fig.1

Fig.2

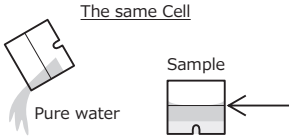

Fig.3

Fig.4

CAUTION

Formazine turbidity is obtained in this method based on JIS K 0101 9.2 Transmitted-light turbidity.
The principle of this method is different from Scattered-light turbidity(NTU Nephelometric Turbidity Unit).

Turbid-P　Turbidity (Polystyrene)

Measurement of turbidity of sample
Calibration　　: Polystyrene Turbidity standard solution
Measurement range : 10 to 100 deg.
Reagent　　: not used
Measurement time : 0 minute

Cell : PACKTEST Square Cup
Wavelength : 660 nm

Procedure

1. Press【Turbid-P】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with pure water for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Take out the Cell, discard the pure water, fill the same Cell with 1.5 mL of sample. (Fig.3)
6. Set the Cell in the cell box again and press【Start】. (Fig.4)
7. The Turbidity will be automatically displayed.

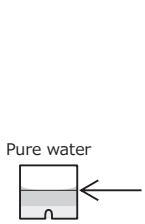

Fig.1

Fig.2

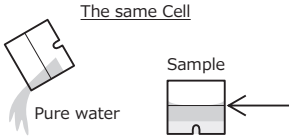

Fig.3

Fig.4

CAUTION

Perform measurement after sufficiently shaking the sample.

Zn-D　Zinc (Low Range)

Color development: Yellow → Orange → Pink
Method　　: 5-Br-PAPS
Range　　: 0.02 — 0.40 mg/L(ppm)
Reagent　　: WAK-Zn (D)　K-1 (Small Pack) , K-2 (Liquid) , Tube
Reaction time : 1 minute after drawing sample into the tube.

Cell : PACKTEST Square Cup
Wavelength : 553 nm

Procedure

1. Press【Zn-D】.
2. Press【OK】to switch to the photometry window.
3. Fill the Cell with the sample for 1.5 mL (up to line). (Fig.1)
4. Put the Cell in the cell box and press【Zero】. (Fig.2)
5. Add K-1 reagent, attach the cap, and sufficiently shake the Cell to completely dissolve the reagent. (Fig.3)
6. Add K-2 reagent for 0.3 mL using pipette, attach the cap and shake the Cell 2 to 3 times, and then remove the cap and let the Cell stand for 5 minutes. (Fig.4)
7. Suck the whole amount of the sample in the Cell into the tube and press【Start】at the same time. (Fig.5)
8. Lightly shake the tube in Step 7 about 30 times. (Fig.6)
9. Return the solution in the tube to the Cell in a gentle manner, set it again in the cell box. (Fig.7)
10. After 1 minute has elapsed, the concentration will be automatically displayed.

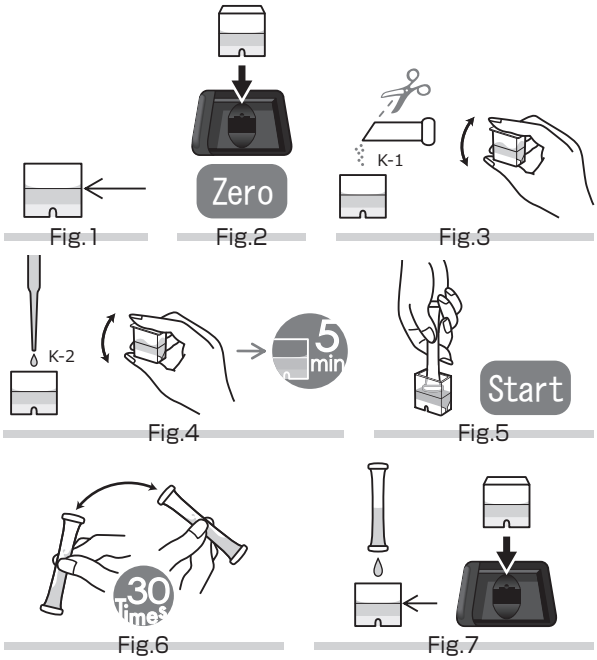

Fig.1 Fig.2 Fig.3 Fig.4 Fig.5 Fig.6 Fig.7

CAUTION

1. In this method, the concentration of ionized zinc (Zn^{2+}) in the sample is measured.
   If result of zinc concentration including suspension and precipitate is required, dissolve zinc in advance and then perform measurement.
2. The optimum pH during color development is 9. If the pH of the sample is not within the range from 5 to 10, neutralize the sample with dilute sulfuric acid or dilute sodium hydroxide solution, etc.
3. Perform measurement with the sample temperature set to 15 to 30℃ .
4. Dissolve orange lumps in the tube as much as possible. Undissolved colorless reagent will not affect the measurement.
5. Use of a measuring pipette or the like instead of the supplied pipette enables more accurate measurement.

Influence of coexisting substance

The stored calibration curve has been created by using the standard solution. If the influence of other substance is considered, check the measurement value by comparing it with the official method or by standard addition method.
The right chart is the list of interference data for acceptable level by adding each of the single substances to the standard solution.

≤ 1000mg/L,: B (Ⅲ) , Ba^{2+} , Ca^{2+} , Cl^- , F^- , I^- , K^+ , Mg^{2+} , Mo (Ⅵ) , Na^+ , NH_4^+ , NO_2^- , NO_3^- , PO_4^{3-} SO_4^{2-} , Phenol
≤ 50mg/L,: Residual Chlorine , Anionic Surfactant
≤ 20mg/L,: CN^- , Cr^{3+}
≤ 10mg/L,: Ag^+ , Al^{3+} , Cr (Ⅵ)
≤ 1mg/L,: Co^{2+} , Cu^{2+} , Mn^{2+} , Fe^{2+} , Fe^{3+} , Ni^{2+}

Seawater does not affect the measurement.