SHIMADZU
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Application News

No.043

Total Organic Carbon Analysis

Quantitation Limit Data for Tap Water Using TOC-L$_{CPH}$

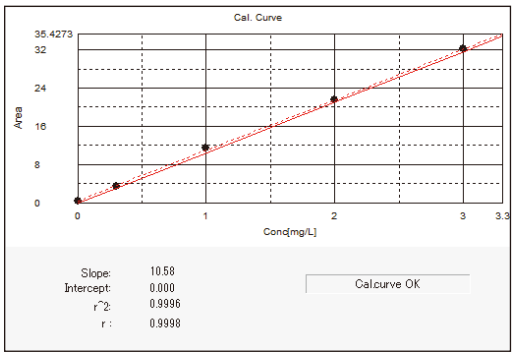
The reference value for "organic matter (Total Organic Carbon (TOC))" in tap water is 3 mg/L according to the Water Quality Standards specified in Japan's Water Supply Act. Thus, the lower limit of quantitation of the TOC analyzer used for this measurement must be 0.3 mg/L, that is, 1/10 the reference value. Here, we introduce examples of measurement at 0.3 mg/L, that is, 1/10 the concentration specified in the standards, using the Shimadzu TOC-L$_{CPH}$ with the regular catalyst and the high sensitivity catalyst.

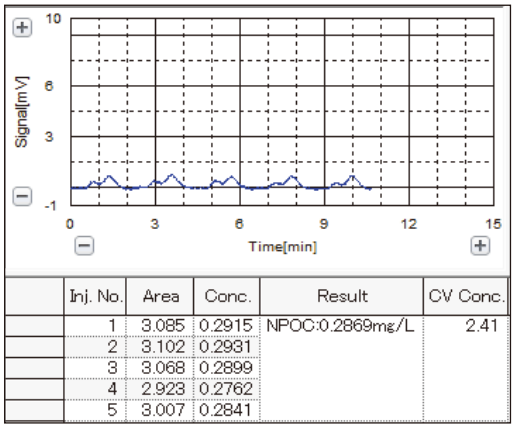
TOC Measurement at 0.3 mg/L Using Regular Catalyst

The results of measurement of a potassium hydrogen phthalate aqueous solution prepared to contain a concentration of 0.25 mgC/L (carbon concentration of 0.25 mg/L) using the regular catalyst are shown in Fig. 1 and Table 1.
The instrument was calibrated with an aqueous solution of potassium hydrogen phthalate at 5 points (0, 0.3, 1, 2, and 3 mgC/L), and a calibration curve was generated. The calibration curve was corrected to eliminate the influence of carbon in the purified water used to prepare the standard solutions by shifting it to pass through the origin.
Due to the inclusion of impurities equivalent to approximately 0.03 mgC/L of TOC in the purified water used to prepare the sample, a measurement value of about 0.28 mgC/L was obtained for the 0.25 mgC/L potassium hydrogen phthalate aqueous solution. However, as the coefficient of variation (CV) value is within the permissible 10 %, it is clear that quantitation at the level of 0.3 mgC/L has been achieved.

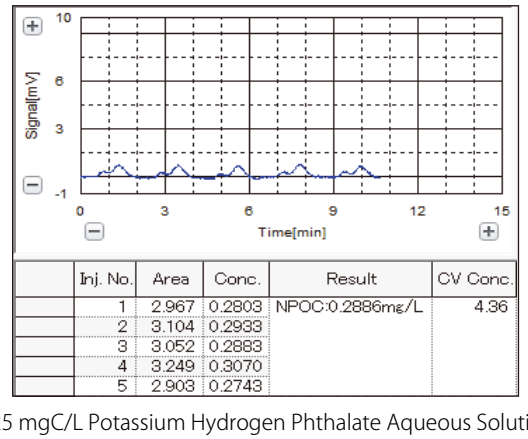
Measurement Conditions

Instrument	: Shimadzu TOC-L$_{CPH}$ Total Organic Analyzer
Catalyst	: Regular catalyst
Injection volume	: 150 µL
Measurement item	: TOC (TOC using acidification and sparging)
Calibration curve	: 5-point calibration curve using 0, 0.3, 1, 2, 3 mgC/L potassium hydrogen phthalate aqueous solutions
Sample	: 0.25 mgC/L potassium hydrogen phthalate aqueous solution (*data*) 0.25 mgC/L Potassium Hydrogen Phthalate Aqueous Solution





	Inj. No.	Area	Conc.	Result	CV Conc.
	1	3.085	0.2915	NPOC:0.2869mg/L	2.41
	2	3.102	0.2931		
	3	3.068	0.2899		
	4	2.923	0.2762		
	5	3.007	0.2841		



	Inj. No.	Area	Conc.	Result	CV Conc.
	1	2.967	0.2803	NPOC:0.2886mg/L	4.36
	2	3.104	0.2933		
	3	3.052	0.2883		
	4	3.249	0.3070		
	5	2.903	0.2743		

0.25 mgC/L Potassium Hydrogen Phthalate Aqueous Solution

Fig. 1 Measurement Data for 0.3 mg/L TOC (using regular catalyst)

Table 1 Measurement Data for 0.3 mg/L TOC (using regular catalyst)

Sample Name	TOC Value [mgC/L]	Coefficient of Variation CV (%)
0.25 mgC/L Potassium Hydrogen Phthalate Aqueous Solution (1st)	0.287	2.41
0.25 mgC/L Potassium Hydrogen Phthalate Aqueous Solution (2nd)	0.289	4.36

TOC Measurement at 0.3 mg/L Using High Sensitivity Catalyst

Next, we measured a potassium hydrogen phthalate aqueous solution prepared to contain a concentration of 0.25 mgC/L (carbon concentration of 0.25 mg/L), this time using high sensitivity catalyst. The results are shown in Fig. 2 and Table 2. When using the high sensitivity catalyst, measurement was conducted using an injection volume of 1000 µL.

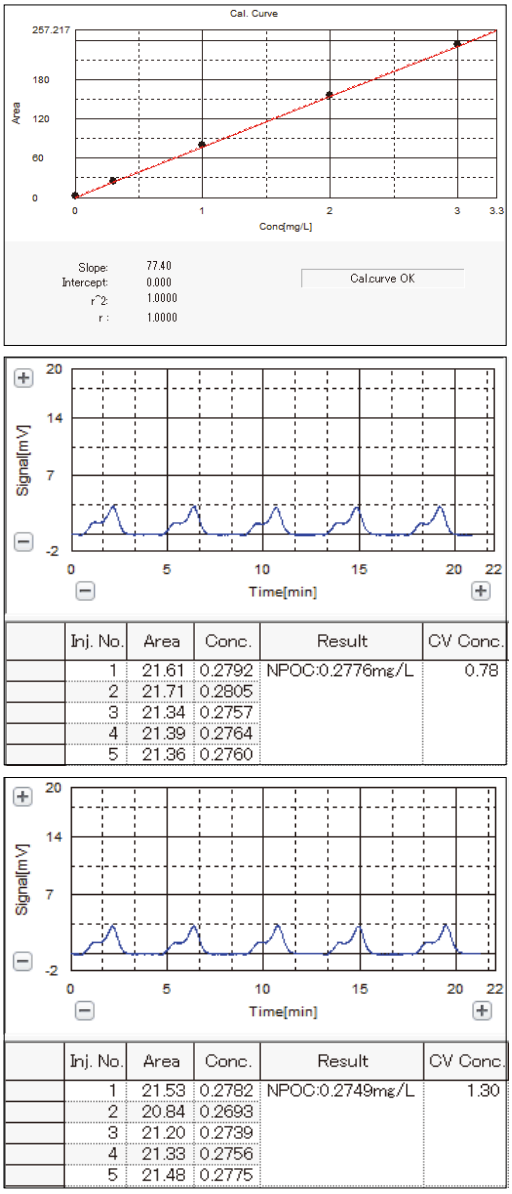
Due to the inclusion of impurities equivalent to approximately 0.03 mgC/L of TOC in the purified water used to prepare the sample, a measurement value of about 0.28 mgC/L was obtained for the 0.25 mgC/L potassium hydrogen phthalate aqueous solution. However, as the coefficient of variation (CV) value is within 1.5 %, it is clear that quantitation has been achieved at the level of 0.3 mgC/L with good accuracy.

Measurement Conditions

Instrument : Shimadzu TOC-LCPH Total Organic Analyzer
Catalyst : High sensitivity catalyst
Injection volume : 1000 µL
Measurement item : TOC (TOC using acidification and sparging)
Calibration curve : 5-point calibration curve using 0, 0.3, 1, 2, 3 mgC/L potassium hydrogen phthalate aqueous solutions
Sample : 0.25 mgC/L potassium hydrogen phthalate aqueous solution (*data*) 0.25 mgC/L Potassium Hydrogen Phthalate Aqueous Solution

Table 2 Measurement Data for 0.3 mg/L TOC (using high sensitivity catalyst)

Sample Name	TOC Value [mgC/L]	Coefficient of Variation CV (%)
0.25 mgC/L Potassium Hydrogen Phthalate Aqueous Solution (1st)	0.278	0.78
0.25 mgC/L Potassium Hydrogen Phthalate Aqueous Solution (2nd)	0.275	1.30



0.25 mgC/L Potassium Hydrogen Phthalate Aqueous Solution

Fig. 2 Measurement Data for 0.3 mg/L TOC (using high sensitivity catalyst)

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