

Application News

No.055

Total Organic Carbon Analysis

Measurement of Purgeable Organic Carbon (POC) by TOC-L

Total organic carbon (TOC) may be classified as either purgeable organic carbon (POC) or non-purgeable organic carbon (NPOC) depending on whether the substance is easily purged from the sample into the air.

$$\text{TOC} = \text{purgeable organic carbon (POC)} + \text{non-purgeable organic carbon (NPOC)}$$

Some compounds containing purgeable organic carbon may cause health problems if they exist in the environment, and if they are used in solvents or fuels, they may cause environmental problems by contaminating rivers or other surface water. Surface water is used as a water source for tap water, so the safety of surface water is a major concern from the perspective of quality control of drinking water. It is important to control the concentrations of purgeable organic substances contained in such water.

Using the purgeable organic carbon (POC) measurement kit option for the Shimadzu TOC-L total organic carbon analyzer, POC levels can be measured by sparging samples at room temperature.

This document introduces an example of a POC measurement of an aqueous solution of purgeable organic compounds using the TOC-L_{CPH} and POC measurement kit system.

■ Preparation of an Aqueous Solution of a Purgeable Organic Compound (Toluene)

Purgeable organic compounds are generally not very soluble in water, so preparing aqueous solutions at specified concentrations is difficult. In this experiment, the objective was to measure toluene, a compound that is soluble in water up to approximately 0.5 g/L.

An aqueous solution was prepared by adding toluene to pure water, so as to arrive at a TOC concentration of 100 mgC/L (100 mg/L carbon concentration). However, toluene is not very soluble in water, so purging during preparation was a concern. Accordingly, the TOC concentration of the prepared aqueous toluene solution was measured using the TOC method from TC-IC. The results showed that the TOC concentration for the aqueous toluene solution was 86.2 mgC/L.

■ NPOC and IC Values in Tap Water

In order to evaluate the POC measurements of tap water with the aqueous toluene solution added, the NPOC value and inorganic carbon (IC) value in tap water were checked. The results are shown in Table 1.

Measurement Conditions

Analyzer	: TOC-L _{CPH} Total Organic Carbon Analyzer
Catalyst	: Standard catalyst
Measurement item	: NPOC and IC
Calibration curve	: NPOC : 2-point calibration curve based on aqueous solutions of potassium hydrogen phthalate at 0 mgC/L to 3 mgC/L. IC : 2-point calibration curve based on aqueous solutions of sodium carbonate and sodium bicarbonate at 0 mgC/L to 20 mgC/L.
Sample	: Tap water from the Shimadzu Sanjo Works

Table 1 Tap Water Measurement Results

Sample Name	NPOC Measurement Value (mgC/L)	IC Measurement Value (mgC/L)
Tap water	0.743	8.36

POC Measurement Results

The aqueous toluene solution was added to tap water to obtain POC values of 0.1 mgC/L, 0.3 mgC/L, 0.5 mgC/L, and 1 mgC/L. These samples were measured, and the results are shown in Table 2. The measurement charts are shown in Fig. 1. It is evident that the POC in tap water was 0 mgC/L, and that the POC values in the mixed samples were measured accurately, with high detection rates.

Measurement Conditions

Analyzer	: TOC-LCPH Total Organic Carbon Analyzer + POC Measurement Kit
Measurement item	: Purgeable Organic Carbon (POC)
Calibration curve	: 3-point calibration curve based on standard solutions (aqueous solutions of sodium carbonate and sodium bicarbonate) for POC measurements at 0 mgC/L, 1 mgC/L, and 2 mgC/L.
Sample	: Prepared by adding an aqueous toluene solution to tap water

Table 2 POC Measurement Results

Sample Name	POC Measurement Value (mgC/L)
Tap water	0
Tap water + POC 0.1 mgC/L	0.100
Tap water + POC 0.3 mgC/L	0.295
Tap water + POC 0.5 mgC/L	0.484
Tap water + POC 1.0 mgC/L	0.987

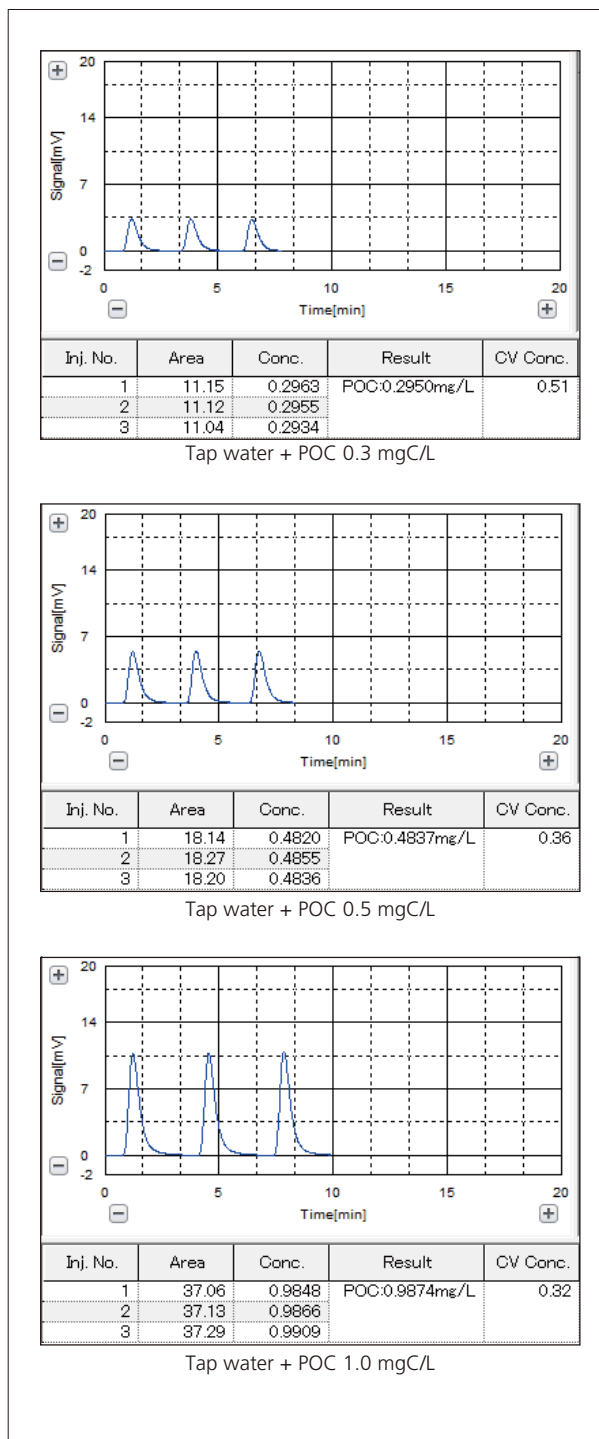
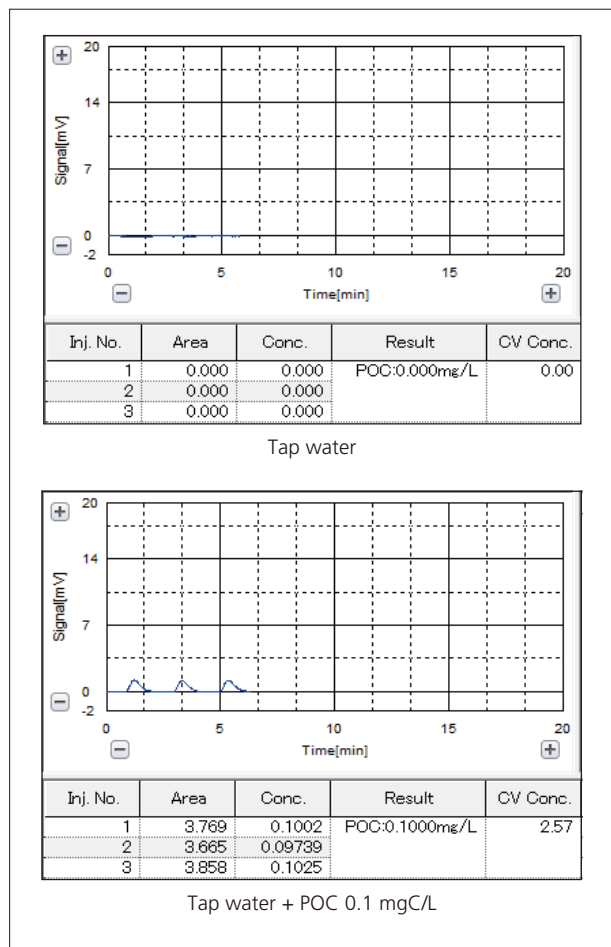


Fig. 1 POC Measurement Data