

HJ

INDUSTRY STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

HJ 501-2009

Water quality - Determination of total organic carbon - Combustion oxidation nondispersive infrared absorption method

水质 总有机碳的测定 燃烧氧化-非分散红外吸收法

(English Translation)

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1 Scope of application

This Standard specifies the combustion oxidation nondispersive infrared absorption method for the determination of total organic carbon (TOC) in surface water, groundwater, domestic sewage and industrial wastewater.

This Standard is applicable to the determination of total organic carbon (TOC) in surface water, groundwater, domestic sewage and industrial wastewater. The detection-limit is 0.1 mg/L, and the lower limit of determination is 0.5 mg/L.

Note 1: The determination of TOC in this Standard is divided into differential subtraction method (3.1) and direct method (3.2). When the content of volatile organic compounds such as benzene, toluene, cyclohexane and trichloromethane in water is high, it shall be determined by the differential subtraction method; when the content of volatile organic compounds in water is relatively low and the content of inorganic carbon is relatively high, it shall be determined by the direct method.

Note 2: When there are elemental carbon particles (soot), carbides, cyanides, cyanates and thiocyanates, they can be measured simultaneously with organic carbon.

Note 3: When there are large particles of suspended solids in the water, due to the limitation of the auto sampler pore size, the determination results do not include all particulate organic carbon.

2 Terms and definitions

The following documents are indispensable for the application of this document.

For dated references, only the dated version applies to this document. For undated references, the latest edition (including all amendments) applies to this document.

The following terms and definitions are applicable to this Standard.

2.1 Total organic carbon, TOC

The sample is acidified and aerated; the inorganic carbon in it is converted into carbon dioxide and removed; the sample is injected into the high-temperature combustion tube to directly measure the total organic carbon. Since the purgeable organic carbon (POC) may lose in acidified aeration, the measured total organic carbon value shall be non-purgeable organic carbon (NPOC).

4 Interference and elimination

When the common coexisting ions in water exceed the following mass concentrations.

SO₄²⁻- 400 mg/L, Cl⁻- 400 mg/L, NO₃⁻- 100 mg/L, PO₄³⁻- 100 mg/L,

S²⁻- 100 mg/L; it's available to use the carbon dioxide-free water (5.1) to dilute the water sample until the above-mentioned coexisting ion mass concentration is lower than the interference allowable mass concentration; then, perform the analysis.

5 Reagents and materials

Unless otherwise specified, the reagents in this Standard shall be analytical reagents in accordance with national standards. The water used shall be carbon dioxide-free water (5.1).

5.1 Carbon dioxide-free water

boil the distilled water in a beaker (10% of evaporation); use it later after cooling. Pure water or ultra-pure water that is prepared by a pure water machine can also be used. Carbon dioxide-free water shall be prepared when necessary; the measured TOC mass concentration shall not exceed 0.5 mg/L.

5.2 Sulfuric acid (H₂SO₄)

$\rho(\text{H}_2\text{SO}_4) = 1.84 \text{ g/ml}$.

5.3 Potassium hydrogen phthalate (KHC₈H₄O₄)

excellent grade.

5.4 Anhydrous sodium carbonate (Na₂CO₃)

excellent grade.

5.5 Sodium bicarbonate (NaHCO₃)

excellent grade.

5.6 Sodium hydroxide solution

$\rho(\text{NaOH}) = 10 \text{ g/L}$.

5.7 Organic carbon standard stock solution

$\rho(\text{organic carbon, C}) = 400 \text{ mg/L}$.

Accurately weigh 0.850 2 g of potassium hydrogen phthalate (dry to constant weight at 110 ~ 120°C in advance); place it in a beaker; add water (5.1) to dissolve; transfer the solution to a 1 000 ml volumetric flask; use water (5.1) to dilute to the mark and mix. It can be stored for two months at 4°C.

5.8 Inorganic carbon standard stock solution

$\rho(\text{inorganic carbon, C}) = 400 \text{ mg/L}$.

Accurately weigh 1.763 4 g of anhydrous sodium carbonate (dry to constant weight at 105°C in advance) and 1.400 0 g of sodium bicarbonate (dry in a dryer

In a set of seven 100 ml volumetric flasks, add 0.00, 2.00, 5.00, 10.00, 20.00,

40.00, 100.00 ml of solution for the differential subtraction standard (5.9); use water (5.1) to dilute to the mark and mix. Formulate into standard series solutions with a total carbon mass concentration of 0.0, 4.0, 10.0, 20.0, 40.0,

80.0, 200.0 mg/L and an inorganic carbon mass concentration of 0.0, 2.0, 5.0,

10.0, 20.0, 40.0, 100.0 mg/L; measure the response value according to the steps in (8.4). Correspond the standard serious solution mass concentration to the response value of the instrument to draw the total carbon and inorganic carbon calibration curves respectively.

8.2.2 Drawing of the direct calibration curve

In a set of seven 100 ml volumetric flasks, add 0.00, 2.00, 5.00, 10.00, 20.00,

40.00, 100.00 ml of solution for the direct method (5.10); use water (5.1) to dilute to the

mark and mix. Formulate into standard series solutions with an organic carbon mass concentration of 0.0, 2.0, 5.0, 10.0, 20.0, 40.0, 100.0 mg/L;

measure the response value according to the steps in (8.4). Correspond the standard serious solution mass concentration to the response value of the instrument to draw the organic carbon calibration curve.

The above calibration curve concentration range can be adjusted according to the instrument and the type of the measured sample.

8.3 Blank test

Use the carbon dioxide free water (5.1) to replace the sample; measure the response value according to the procedure in (8.4). The TOC content of carbon dioxide-free water (5.1) shall be measured first in each test; the measured value shall not exceed 0.5 mg/L.

8.4.1 Differential subtraction method

For the acidified sample, use sodium hydroxide solution (5.6) to neutralize to neutrality before the determination; take a certain volume to inject into the TOC analyzer for determination; record the corresponding response value.

8.4.2 Direct method

Take a certain volume to acidify it to $\text{pH} \leq 2$; inject the sample into the TOC analyzer; remove the inorganic carbon by aeration; introduce it into a high- temperature oxidation furnace; record the corresponding response value.

9.1 Differential subtraction method

GB 5085.1-2007 | GB/T 11892-1989 | HJ 505-2009 |