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Research paper

A high-temperature catalytic oxidation method for the determination of non-volatile dissolved organic carbon in seawater by direct injection of a liquid sample

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Abstract

A method is described for the rapid, precise determination of non-volatile dissolved organic carbon in seawater in concentrations between 0 and 2000 Î¼M. The oxidation is carried out on a platinum catalyst at 680 Â°C under an oxygen atmosphere after the sample has been freed of inorganic carbon, and the concentration of the CO_2 generated is measured with a non-dispersive IR gas analyzer. The determination can be carried out on board ship with a precision of Â±2% using a sample volume of 200 Î¼l. The results obtained using this method are of a much higher value than those obtained using

persulfate oxidation methods. The molecular weight dependency of the results clearly indiates that the above discrepancy is caused by the low oxidation efficiency of the persulfate oxidation method against high-polymer organic matter dissolved in seawater. The results reveal that the concentration of dissolved organic carbon in surface water is about 300 Î¼M and decreases with depth. An examination of molecular weight distribution indicates that the concentration of high-polymer organic carbon decreases rapidly from surface to deeper layers, with molecular weight ranging from 1.8 x 10^3 to 6 x 10^4 Dalton. It is noted that there is an inverse correlation between the concentration of dissolved organic carbon and apparent oxygen utilization (AOU). Frozen or acidified preservation of unfiltered samples does not give reliable results. An essential requirement for dissolved carbon analysis is membrane filtration just after sampling and real-time analysis on board. Because of the well-defined principle of the oxidation process, its reliability, the ease of sample handling and of the analytical procedure on board or in the land laboratory, and the consistency of the oceanographic parameters, this method is much more suitable for the analysis of marine dissolved organic carbon than the methods used previously.

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