International Standard

ISO 18191

Water quality — Determination of pH_T in seawater — Method using the indicator dye *m*-cresol purple

Qualité de l'eau — Détermination du pH_T dans l'eau de mer — Méthode utilisant l'indicateur coloré au pourpre de m*-crésol*

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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This document was prepared by Technical Committee ISO/TC 147, *Water quality*, Subcommittee SC 2, *Physical, chemical and biochemical methods*.

This second edition cancels and replaces the first edition (ISO 18191:2015), which has been technically revised.

The main changes are as follows:

— update of terms and definitions;

— addition of Clause A.1 dedicated to method performance data based on an interlaboratory comparison on TRIS buffer and natural seawater;

— addition of guidance on the measurement procedure and calculation and expression of results;

— editorial improvements throughout.

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

The greenhouse effect induced by anthropogenic carbon dioxide, CO_2, in the atmosphere is one of the serious global environmental issues. A key factor controlling the atmospheric CO_2 is its absorption into the ocean. As a result of the absorption, the pH in the upper layer of the ocean is observed to have fallen gradually, and its influence on the living organisms is a matter of concern all over the world.

On the other hand, carbon capture and storage (CCS) technology is considered as a useful means of reducing the CO_2 emissions from fossil fuel. When ocean environment such as sub-seabed aquifer is selected as a storage site, the monitoring of carbonate system including pH in seawater becomes very important. The analytical method for pH_T (the total hydrogen ion concentration pH scale) in seawater samples requires specific conditions and techniques essential to the precise and accurate determination. This document describes a method for the determination of pH_T in seawater with the repeatability less than 0,003.

This method provides international communities accurate data sets on pH_T in seawater being compatible with each other. This is the base of national and international operational observation or monitoring programs of the oceanic carbonate system as well as individual research works.

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WARNING — Persons using this document should be familiar with normal laboratory practice. This document does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user to establish appropriate safety and health practices and to ensure compliance with any national regulatory conditions.

IMPORTANT — It is absolutely essential that tests conducted in accordance with this document be carried out by suitably qualified staff.

1 Scope

This document specifies a spectrophotometric determination of the pH_T of seawater on the total hydrogen ion concentration pH scale. The total hydrogen ion concentration, $[H^+]_T$, is expressed as moles per kilogram of seawater. The method is suitable for assaying oceanic levels of pH_T from 7,4 to 8,2 for normal seawater of practical salinity ranging from 20 to 40.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
total hydrogen ion concentration
$[H^+]_T$
total hydrogen ion concentration of seawater, including the contribution of free hydrogen ions and the hydrogen ions bound to sulfate ions in the seawater

Note 1 to entry: The total hydrogen ion concentration of seawater is defined in Formula (1) as:

$$[H^+]_T = [H^+]_F \left(1 + S_T / K_S\right) \approx [H^+]_F + [HSO_4^-] \quad (1)$$

where

$[H^+]_F$ is the free concentration of hydrogen ion in seawater;

S_T is the total sulfate concentration $\left(\left[HSO_4^-\right] + \left[SO_4^{2-}\right]\right)$;

K_S is the acid dissociation constant for HSO_4^-.

The pH_T is then defined as the negative of the base 10 logarithm of the hydrogen ion concentration as given in Formula (2):

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