INTERNATIONAL STANDARD

ISO 18191

First edition
2015-09-01

Water quality — Determination of pH_t in sea water — 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

Reference number
ISO 18191:2015(E)

ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

Contents

Page

Foreword

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 147, *Water quality*, Subcommittee SC 2, *Physical, chemical and biochemical methods*.

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 sea water becomes very important. The analytical method for pH_t in sea water (the total hydrogen ion concentration pH scale) samples requires specific conditions and techniques essential to the precise and accurate determination. This International Standard describes a method for the determination of pH_t in sea water with the repeatability less than 0,003.

This method will provide international communities accurate data sets on pH_t in sea water 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 International Standard should be familiar with normal laboratory practice. This International Standard 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 International Standard be carried out by suitably qualified staff.

1 Scope

This International Standard specifies a spectrophotometric determination of the pH_t of sea water on the total hydrogen ion concentration pH scale using the indicator dye *m*-cresol purple. The total hydrogen ion concentration, $[H^+]_t$, is expressed as moles per kilogram of sea water. The method is suitable for assaying oceanic levels of pH_t 7,4 to 8,2 for normal sea water of practical salinity ranging from 20 to 40.

2 Terms and definitions

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

2.1
total hydrogen ion concentration $[H^+]_t$
hydrogen ion concentration including the contribution of the hydrogen sulfate ions in the sea water

Note 1 to entry: Total hydrogen ion concentration is defined as:

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

where

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

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

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:

$$pH_t = -\log_{10}\left(\frac{[H^+]_t}{\text{mol/kg}}\right)$$

2.2
practical salinity
S
ratio K_{15} of the electrical conductivity of the sea water sample at the temperature of 15 °C on IPTS-68 and the pressure of one standard atmosphere, to that of a potassium chloride (KCl) solution, in which the mass fraction of KCl is $32{,}435\ 6 \times 10^{-3}$, at the same temperature and pressure