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Water quality — Determination of ammonium nitrogen in water — Small-scale sealed tube method

Qualité de l'eau — Détermination de l'azote ammoniacal dans l'eau — Méthode à petite échelle en tubes fermés

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

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

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.

Introduction

Ammonium nitrogen is one of the possible forms of nitrogen present in water. It can come directly from industrial or public waste, from fertilizers or can be generated by the microbial breakdown of urea and proteins under anaerobic conditions. Ammonium nitrogen can also be found naturally in water in aquifers with low flow velocities, which are confined and contain organic matter.

Water quality — Determination of ammonium nitrogen in water — Small-scale sealed tube method

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.

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 method for the determination of ammonium nitrogen (NH_4-N) in drinking water, groundwater, surface water, wastewater, bathing water and mineral water using the small-scale sealed tube method. The result can be expressed as NH_4 or NH_4-N or NH_3 or NH_3-N.

NOTE 1 In the habitual language use of sewage treatment and on the displays of automated sealed-tube test photometers or spectrophotometers, NH_4 without indication of the positive charge has become the common notation for the parameter ammonium. This notation is adopted in this document even though not being quite correct chemical nomenclature.

This method is applicable to (NH_4-N) concentration ranges from 0,01 mg/l to 1 800 mg/l of NH_4-N. The measuring ranges of concentration can vary depending on the type of small-scale sealed tube method of different manufacturers. Concentrations even slightly higher than the upper limit indicated in the manufacturers manual relating to the small-scale sealed tube method used, cannot be reported as accurate results. It is up to the user to choose the small-scale sealed tube test with the appropriate application range or to adapt samples with concentrations exceeding the measuring range of a test by preliminary dilution.

NOTE 2 The results of a small-scale sealed tube are most precise in the middle of the application range of the test.

All manufacturers' methods are based on the Berthelot reaction and its modifications to develop indophenol blue colour. Reagents mixtures can differ slightly based on manufacturers small-scale sealed tube method, see Clause 9. This method is applicable to non-preserved samples by using small-scale sealed tubes for the determination of drinking water, groundwater, surface water, wastewater and to preserved samples. The method is applicable to samples with suspended materials if these materials are removable by filtration.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 5664, *Water quality — Determination of ammonium — Distillation and titration method*

ISO 5667-1, *Water quality — Sampling — Part 1: Guidance on the design of sampling programmes and sampling techniques*

ISO 5667-3, *Water quality — Sampling — Part 3: Preservation and handling of water samples*

ISO 5667-10, *Water quality — Sampling — Part 10: Guidance on sampling of waste water*

ISO 8466-1, *Water quality — Calibration and evaluation of analytical methods — Part 1: Linear calibration function*

ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*

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
small-scale sealed tube
glass tube commercially available on the market prefilled by different manufacturers with reagent(s) to develop a colour to be read by a photometer or spectrophotometer

4 Principle

This method is based on the principle of Berthelot reaction and its modification to develop indophenol blue colour. In strongly alkaline solution, ammonia reacts with dichloroisocyanurate and salicylate ions or chlorophenol ions, forming blue indophenol. The presence of sodium nitroprusside as catalyst promotes the development of the blue colour. Small-scale sealed tube is read on a photometer or spectrophotometer.

The method serves to obtain the concentration of ammonium nitrogen present in the sample.

5 Interferences

Typical interferences are due to both cations and anions. Examples for maximum tolerable concentration values are listed in Table 1. These values refer to both small-scale sealed tube methods applicable at high concentrations and to those applicable at low concentrations of NH_4-N.

Every manufacturer of small-scale sealed tubes shall provide information about interference levels above which the ion interferes. The concentration of interfering substances can depend on the ratio of sampled volume and predosed reagents, in the small-scale sealed tube.

Table 1 — Example of interfering ions

Ion	Maximum tolerable concentration mg/l
Cl^-	1 000
SO_4^{2-}	1 000
K^+	500
NO_3^-	250
Na^+	500
CO_3^{2-}	50
Ca^{2+}	500
Cu^{2+}	50
Cr^{3+}	50
Co^{2+}	50
Zn^{2+}	50