
**Water quality — Determination
of total cyanide — Method using
segmented flow injection, in-line
ultraviolet digestion analysis by gas
diffusion and amperometric detection**

*Qualité de l'eau — Dosage du cyanure total — Méthode utilisant
l'injection en flux segmenté, l'analyse par digestion UV continue par
diffusion de gaz et la détection ampérométrique*



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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).

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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

Methods using flow analysis automated wet chemical procedures are particularly suitable for the determination of many analytes in water in large sample series at a high analysis frequency.

Analyses can be performed by segmented flow injection analysis (SFIA) using the feature of an automatic dosage of the sample into a flow system (manifold) where the analyte in the sample is digested with ultraviolet radiation at 312 nm and the reagent solutions on its way through the manifold. The reaction product is measured by a flow detector (for example amperometer).

Speciation of cyanide species can be inferred by comparing free cyanide in accordance with ISO 17690:2015, available weak and dissociable cyanide in accordance with ISO 20950-1, and total cyanide using this method.

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IMPORTANT NOTE — The performance of this method has been established for a range of sample matrices, which are reported in ANNEX C. These matrices represent environmental, mining influenced and metallurgical process samples. This method is therefore recommended for mining impacted samples. Caution is recommended for the application of alternative ISO methods to mining influenced and metallurgical process samples if those matrices are not explicitly mentioned in the scope; as potential biases and interferences typical for them have not been sufficiently investigated and may not be properly mitigated.

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 neutralization and proper disposal of waste solutions.

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 operationally defined methods for the determination of total cyanide in various types of water such as drinking water, ground water, surface water, wastewaters, metallurgical processing tailings reclaim solution, heap leach barren solution, mill slurry tailings filtrate and leaching solutions, with cyanide concentrations from 5 µg/l to 2 000 mg/l expressed as cyanide ions in the undiluted sample. The range of application can be extended by reducing the sensitivity ([Figure A.1](#)).

NOTE ISO 2080:2008, 3.105, defines free cyanide. The concentration of total cyanide as defined in ISO 2080:2008, 3.191 includes free cyanide, cyanide complexed with metals in solution as cyanide anion, but not necessarily all of the metal cyanide complexes present as determined by a specified analytical method.

In this method, six suitable mass concentration ranges from 5 µg/l to 50 µg/l, from 50 µg/l to 500 µg/l, from 0,5 mg/l to 5 mg/l, from 5 mg/l to 50 mg/l, from 50 mg/l to 500 mg/l and from 500 mg/l to 2 000 mg/l are described.

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 3696, *Water for analytical laboratory use — Specification and test methods*

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

ISO 8466-1, *Water quality — Calibration and evaluation of analytical methods and estimation of performance characteristics — Part 1: Statistical evaluation of the linear calibration function*

ISO 8466-2, *Water quality — Calibration and evaluation of analytical methods and estimation of performance characteristics — Part 2: Calibration strategy for non-linear second-order calibration functions*