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Water quality — Determination of dissolved chromium(VI) in water — Photometric method

Qualité de l'eau — Détermination du chrome dissous(VI) dans l'eau — Méthode photométrique

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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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 document 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*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 230, *Water analysis*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This first edition of ISO 18724:2025 cancels and replaces ISO 11083:1994, ISO 18412:2005 and ISO 23913:2006.

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

Chromium is an important raw material in the industrial manufacturing process that can contaminate sources of drinking water (e.g. groundwater, surface water). The most common oxidation states of chromium are +3 and +6. The hexavalent form (Cr(VI)) is far more toxic and water-polluting than the trivalent form (Cr(III)).

The chromium content depends on several factors: the availability of chromium in the rock, the weathering stage and the vicinity. Chromium(VI) occurs mainly in the aerobic environment; under reducing or anaerobic conditions, chromium(VI) is reduced to chromium(III).

Chromium(VI) occurs naturally in groundwater aquifers, mostly in low concentrations depending on the occurrence in geological formations, e.g. volcanic rocks.

Other sources of chromium(VI) contamination for the environment are industrial activities, e.g. the production of textiles, leather tanning or electroplating.

A sensitive and specific photometric method for the determination of hexavalent chromium is the reaction with 1,5-diphenylcarbazide (DPC). Most of the standardized procedures are based on DPC chemistry, specifying different reaction conditions.

This procedure describes a uniform procedure that can be used for different photometric measuring devices, such as static or dynamic techniques. The available techniques vary in sensitivity. The choice of the technique used for the measurement depends on the chromium(VI) concentration expected in the sample.

The choice of the analytical technique to be used and the needs-based sample preparation (e.g. matrix elimination) enables the determination of chromium(VI) in concentrations ≥ 0,02 µg/l in raw water, drinking water, surface water, aqueous eluates, cooling water and treated wastewater, provided that the matrix does not contain any reducing substances. Typical areas of application for the static techniques as well as FIA and CFA are samples with chromium(VI) concentrations ≥ 2 µg/l. When using cuvettes with large optical path lengths, for example > 100 mm, the range of application can be extended to concentrations < 2 µg/l chromium(VI) (see Annex A, Annex B, Clause C.2 and Clause C.3). When using coupled techniques [e.g. ion chromatography with post-column reaction (IC-PCR)], chromium(VI) concentrations ≥ 0,02 µg/l can be determined (see Clause C.4).

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Water quality — Determination of dissolved chromium(VI) in water — Photometric 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 photometric determination of dissolved chromium(VI) using manual, (e.g. hand photometry), automated static (e.g. discrete analyser system) or automated dynamic [e.g. flow injection analysis (FIA), continuous flow analysis (CFA)] or ion chromatography with post-column reaction (IC-PCR)] techniques.

The method described in this document is applicable for other matrices, such as leachates from landfills and raw wastewater, after appropriate method validation.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes the 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 8466-1, *Water quality — Calibration and evaluation of analytical methods — Part 1: 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*

ISO/TS 13530, *Water quality — Guidance on analytical quality control for chemical and physicochemical water analysis*

3 Terms and definitions

No terms and definitions are listed in this document.

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/

4 Interferences

4.1 General

The influence of the matrix interferences can vary considerably and depends on the type of sample. Matrix interferences can be detected by recovery or spiking attempts.

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