International Standard

ISO 18724

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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Foreword

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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).