INTERNATIONAL STANDARD

ISO 17690

First edition
2015-03-15

Water quality — Determination of available free cyanide (pH 6) using flow injection analysis (FIA), gas-diffusion and amperometric detection

Qualité de l'eau — Dosage des cyanures libres disponibles (pH 6) par analyse avec injection en flux (FIA), diffusion de gaz et détection ampérométrique

Reference number
ISO 17690:2015(E)

© ISO 2015



COPYRIGHT PROTECTED DOCUMENT

© ISO 2015

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

Foreword ... **iv**
Introduction ... **v**
1 Scope ... **1**
2 Normative references ... **1**
3 Terms and definitions ... **1**
4 Interferences ... **2**
4.1 Interferences by oxidizing agents ... 2
4.2 Interferences by sulfide ... 2
5 Principle ... **2**
6 Reagents ... **2**
7 Apparatus ... **4**
8 Sampling and sample preparation ... **5**
9 Procedure ... **5**
9.1 Flow system set up ... 5
9.2 Reagent blank measurement ... 6
9.3 Checking the suitability of the flow injection system ... 6
9.3.1 Electrode stabilization ... 6
9.3.2 Recovery rates ... 6
9.4 Calibration ... 7
9.5 Sample measurement ... 7
10 Calculations ... **7**
11 Expression of results ... **8**
12 Test report ... **8**
Annex A (informative) **Example of a flow injection system** ... **9**
Annex B (normative) **Determination of the real cyanide concentration in the potassium cyanide solution (6.5.1)** ... **10**
Annex C (informative) **Performance data** ... **11**
Bibliography ... **12**

© ISO 2015 – All rights reserved

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 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*.

© ISO 2015 – All rights reserved

Introduction

Methods using flow analysis automate wet chemical procedures and 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 flow injection analysis (FIA) using the feature of an automatic dosage of the sample into a flow system (manifold) where the analytes in the sample reacts with the reagent solutions on their way through the manifold. The sample preparation can be integrated in the manifold. The reaction product is measured by a flow detector (e.g. amperometer).

© ISO 2015 – All rights reserved

Water quality — Determination of available free cyanide (pH 6) using flow injection analysis (FIA), gas-diffusion and amperometric detection

WARNING — Persons using this International Standard should be familiar with the 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 including neutralization and proper disposal of waste solutions.

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 methods for the determination of available free cyanide at pH 6 in various types of water (such as ground, drinking, surface, leachate, waste water, and metallurgical processing waste water) with cyanide concentrations from 5 µg/l to 500 µg/l expressed as cyanide ions in the undiluted sample. The range of application can be changed by varying the operation conditions, e.g. by using a different injection volume (Figure A.1).

NOTE 1 ISO 2080:2008, 3.105, the concentration of available free cyanide as determined by a specified analytical method.

NOTE 2 The detection limit for this method was determined by interlaboratory testing at the national level using ASTM International D6512 Practice for Interlaboratory Quantitation Estimate.

NOTE 3 Free cyanides according to ISO 14403 and ISO 17690 are not equivalent.

In this method, two suitable mass concentration ranges from 5 µg/l to 50 µg/l and from 50 µg/l to 500 µg/l are described.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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*

3 Terms and definitions

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

© ISO 2015 – All rights reserved