

Australian Standard[®]

Analysis of soils

**Part 2: Extraction of heavy metals
and metalloids from soil by aqua
regia—Hotplate digestion method**

This Australian Standard was prepared by Committee CH/28, Sampling and Analysis of Soils and Biota. It was approved on behalf of the Council of Standards Australia on 15 October 1997 and published on 5 December 1997.

The following interests are represented on Committee CH/28:

Agriculture Victoria
Association of Consulting Engineers, Australia
Australasian Institute of Mining and Metallurgy
Australian Collaborative Land Evaluation Program
Australian Gas Association
Australian Government Analytical Laboratory
Australian Institute of Environmental Health
Australian Institute of Medical Scientists
Australian Nuclear Science & Technology Organization
Australian Society of Soil Science Incorporated
CSIRO - Division of Soils
CSIRO - Mathematical and Information Sciences
Department of Mineral Resources, N.S.W.
Department of Natural Resources, Queensland
Environment Institute of Australia
Environment Protection Authority of N.S.W.
Environment Protection Authority of Victoria
Hunter Area Health Services
Minerals Council of Australia
National Association of Testing Authorities, Australia
Public Health Unit Central and Southern Sydney
Queensland Health Scientific Services
Royal Australian Chemical Institute
University of Sydney

Review of Australian Standards. To keep abreast of progress in industry, Australian Standards are subject to periodic review and are kept up to date by the issue of amendments or new editions as necessary. It is important therefore that Standards users ensure that they are in possession of the latest edition, and any amendments thereto.

Full details of all Australian Standards and related publications will be found in the Standards Australia Catalogue of Publications; this information is supplemented each month by the magazine 'The Australian Standard', which subscribing members receive, and which gives details of new publications, new editions and amendments, and of withdrawn Standards.

Suggestions for improvements to Australian Standards, addressed to the head office of Standards Australia, are welcomed. Notification of any inaccuracy or ambiguity found in an Australian Standard should be made without delay in order that the matter may be investigated and appropriate action taken.

This Standard was issued in draft form for comment as DR 97104.

Australian Standard[®]

Analysis of soils

Part 2: Extraction of heavy metals and metalloids from soil by aqua regia—Hotplate digestion method

First published as AS 4479.2—1997.

PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee CH/28, Sampling and Analysis of Soils and Biota and is based on ISO 11466:1995, *Soil quality—Extraction of trace elements soluble in aqua regia*.

This Standard is the result of a consensus among the representatives on the Joint Committee to produce it as an Australian Standard.

The objective of this Standard is to provide a method of extraction of metals from soils by aqua regia, prior to determination by atomic absorption spectrometry, inductively coupled plasma spectrometry or other appropriate technique. The method is not suitable for speciation studies and the results do not constitute bioavailable heavy metal content of soils.

The subsequent determination should be carried out in accordance with the relevant Australian Standard.

It has been assumed that executing the provisions of this document is restricted to appropriately qualified and experienced people. This Standard calls for the use of procedures that may be hazardous or injurious to health if adequate precautions are not taken.

CONTENTS

	<i>Page</i>
1 SCOPE	3
2 REFERENCED DOCUMENTS	3
3 DEFINITIONS	4
4 PRINCIPLE	4
5 APPARATUS	4
6 REAGENTS	5
7 PROCEDURE	5
8 PRECISION	6
9 TEST REPORT	9

© Copyright — STANDARDS AUSTRALIA

Users of Standards are reminded that copyright subsists in all Standards Australia publications and software. Except where the Copyright Act allows and except where provided for below no publications or software produced by Standards Australia may be reproduced, stored in a retrieval system in any form or transmitted by any means without prior permission in writing from Standards Australia. Permission may be conditional on an appropriate royalty payment. Requests for permission and information on commercial software royalties should be directed to the head office of Standards Australia.

Standards Australia will permit up to 10 percent of the technical content pages of a Standard to be copied for use exclusively in-house by purchasers of the Standard without payment of a royalty or advice to Standards Australia.

Standards Australia will also permit the inclusion of its copyright material in computer software programs for no royalty payment provided such programs are used exclusively in-house by the creators of the programs.

Care should be taken to ensure that material used is from the current edition of the Standard and that it is updated whenever the Standard is amended or revised. The number and date of the Standard should therefore be clearly identified.

The use of material in print form or in computer software programs to be used commercially, with or without payment, or in commercial contracts is subject to the payment of a royalty. This policy may be varied by Standards Australia at any time.

STANDARDS AUSTRALIA

Australian Standard

Analysis of soils

Part 2: Extraction of heavy metals and metalloids from soil by aqua regia—Hotplate digestion method

1 SCOPE This Standard specifies a method for the extraction of heavy metals from soil using aqua regia. Analytical techniques appropriate to the analyte content in the soils are used for the subsequent determinations of heavy metals and metalloids in the resulting solution.

Sediments, sludges (containing less than 20% organic carbon) and other silicate materials (e.g. fill material and brick) may be extracted using this method.

NOTES:

1 The method produces a solution for determination of aqua regia extractable metals. The solution is not suitable for speciation studies, nor do the values obtained necessarily represent the total or bio-available heavy metal content of the soils.

2 No acid digestion procedure necessarily results in complete extraction of the analyte, therefore different acid digestion procedures may yield different results.

Users of this Standard should carry out a programme of analysis using reference materials to assure themselves that the method given here is appropriate for their needs. This method is suitable for use in conjunction with ANZECC/NHMRC Guidelines*, provided the appropriate method validation details are given.

Other methods use different acid combinations such as nitric/perchloric and reverse aqua regia.

3 AS 4479.1 specifies requirements for pretreatment of soil samples for analysis.

4 This procedure is to be performed only by an analyst familiar with the operational procedures associated with acid digestion.

2 REFERENCED DOCUMENTS The following documents are referred to in this Standard:

AS

- 1289 Methods of testing soils for engineering purposes
- 1289.2 Part 2: Soil moisture content tests
- 2162 Verification and use of volumetric glassware
- 2162.1 Part 1: General—Volumetric glassware
- 2164 Laboratory glassware—One-mark volumetric flasks
- 2243 Safety in laboratories
- 2243.8 Part 8: Fume cupboards

* Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites and as subsequently amended/supplemented by the Australian and New Zealand Environment and Conservation Council and the National Health and Medical Research Council.