

This is a preview of "ISO/TR 20489:2018". [Click here to purchase the full version from the ANSI store.](#)

First edition  
2018-12

---

---

## **Nanotechnologies — Sample preparation for the characterization of metal and metal-oxide nano-objects in water samples**

*Nanotechnologies — Préparation des échantillons pour la caractérisation de nano-objets métalliques et d'oxydes métalliques dans les échantillons d'eau*



Reference number  
ISO/TR 20489:2018(E)

© ISO 2018

This is a preview of "ISO/TR 20489:2018". [Click here to purchase the full version from the ANSI store.](#)



**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2018

All rights reserved. Unless otherwise specified, or required in the context of its implementation, 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  
CP 401 • Ch. de Blandonnet 8  
CH-1214 Vernier, Geneva  
Phone: +41 22 749 01 11  
Fax: +41 22 749 09 47  
Email: [copyright@iso.org](mailto:copyright@iso.org)  
Website: [www.iso.org](http://www.iso.org)

Published in Switzerland

This is a preview of "ISO/TR 20489:2018". [Click here to purchase the full version from the ANSI store.](#)

## Contents

	Page
<b>Foreword</b> .....	<b>iv</b>
<b>Introduction</b> .....	<b>v</b>
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>1</b>
<b>3 Terms and definitions</b> .....	<b>1</b>
<b>4 Symbols and abbreviated terms</b> .....	<b>2</b>
<b>5 Types of metal and metal oxide-based manufactured nano-objects</b> .....	<b>2</b>
<b>6 Types of water matrices of interest</b> .....	<b>2</b>
<b>7 Sample collection and storage</b> .....	<b>3</b>
7.1 General.....	3
7.2 Containers for sample collection and storage.....	3
<b>8 Sample pre-treatment</b> .....	<b>3</b>
8.1 Introduction.....	3
8.2 Sedimentation and centrifugation.....	4
8.2.1 Sedimentation.....	4
8.2.2 Centrifugation.....	4
8.2.3 Stepwise sedimentation and centrifugation.....	4
8.2.4 Factors affecting centrifugation and sedimentation.....	4
8.2.5 Advantages and limitations of centrifugation.....	5
8.3 Filtration.....	5
<b>9 Size fractionation techniques</b> .....	<b>5</b>
9.1 Introduction.....	5
9.2 Field-flow fractionation (FFF).....	6
9.2.1 Introduction.....	6
9.2.2 Advantages and limitations.....	6
9.3 Ultrafiltration.....	7
9.4 Size exclusion chromatography.....	7
<b>Annex A (informative) Relevant nano-object characterization techniques</b> .....	<b>8</b>
<b>Bibliography</b> .....	<b>9</b>

## 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](http://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](http://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 of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 229, *Nanotechnologies*.

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](http://www.iso.org/members.html).

This is a preview of "ISO/TR 20489:2018". [Click here to purchase the full version from the ANSI store.](#)

## Introduction

With the increasing use of manufactured nano-objects in commercial products and applications, such as consumer and healthcare products, solar panels, batteries, surface coatings, and water treatment, it is likely that these nano-objects will eventually be released to the environment, especially in aquatic environments. There are, however, limited technical data available on the occurrence/transport/fate of manufactured nano-objects after they are released to the aquatic environment. Together with the current global shortage of water supply and an increasing demand for water recycling, concerns for the potential health impacts of manufactured nano-objects in water will increase.

Related to nano-objects in aqueous matrices, knowledge of environmental parameters like natural organic matter content, pH, ionic strength (IS) etc., is important since these may influence particle size, fate, stability and chemical composition. An aqueous sample can be a complex mixture of particles of different nature, size, reactivity, composition, agglomeration state and shape. Hence the initial preparation of the samples, such as pre-treatment and size fractionation, are critical steps for any subsequent analysis of the nano-objects. A consolidated table listing common fractionation techniques is given by Simonet, et al.<sup>[1]</sup> and Hasselov, et al.<sup>[2]</sup>.

Although several methods for the detection and characterization of manufactured nano-objects in aqueous matrices are described in ISO/TR 18196:2016, the methods are at various stages of development into technical specifications or standards. Most importantly, there is no accepted standard as yet on pre-analysis treatment (i.e. collection, storage and size fractionation) of manufactured nano-objects in water. This document can contribute to the development of a future international standard for the analysis and characterization of metal and metal-oxide nanoparticles in aqueous matrices. This will allow interlaboratory comparison of results and contribute to future studies of commercial products containing manufactured nano-objects, thus, finally, support the growth of nanotechnology related industries.