
**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*



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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.

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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.

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.[1] and Hasselov, et al.[2].

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.

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

1 Scope

This document provides an overview of approaches of sample preparation (i.e. pre-treatment and size-fractionation) for analytical measurements applied to surface and drinking water, potentially containing relevant amounts and types of metal and metal oxide nano-objects, including collection from source and storage of samples, pre-concentration of analytes, and their fractionation.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1

manufactured nanomaterial

nanomaterial intentionally produced to have selected properties or composition

[SOURCE: ISO/TS 80004-1:2015, 2.9]

3.2

measurand

quantity intended to be measured

[SOURCE: ISO/IEC Guide 99:2007, 2.3, modified — The notes to entry have been deleted.]

3.3

nano-object

discrete piece of material with one, two or three external dimensions in the nanoscale

Note 1 to entry: The second and third external dimensions are orthogonal to the first dimension and to each other.

[SOURCE: ISO/TS 80004-2: 2015, 2.2]

3.4

nanostuctured material

material having internal nanostructure or surface nanostructure

Note 1 to entry: If external dimensions are in the nanoscale, the term *nano-object* (3.2) is recommended.

[SOURCE: ISO/TS 80004-1:2015, 2.7, modified — Note 1 to entry has been replaced.]