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Good practice for dynamic light scattering (DLS) measurements

Bonnes pratiques pour l'analyse de la dispersion lumineuse dynamique (DLD)

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Contents

Page

Foreword ... **iv**
Introduction ... **v**
1 Scope ... **1**
2 Normative references ... **1**
3 Terms and definitions ... **1**
4 Instrument types ... **1**
4.1 General ... 1
4.2 Information prior to analysis ... 2
4.2.1 Sample information ... 2
4.2.2 Desired outcome of analysis ... 3
4.3 Appropriateness of samples for DLS analysis ... 5
4.4 Sample preparation ... 5
4.4.1 General ... 5
4.4.2 Dispersion ... 6
4.4.3 Filtering of sedimenting particle systems ... 6
4.4.4 Dissolution and expansion ... 7
4.4.5 Colour of samples ... 7
4.4.6 Dilution ... 8
4.4.7 Generation of air bubbles ... 9
4.4.8 Measurement cell (only relevant when using cuvettes in a homodyne setup) ... 9
4.5 Instrument verification ... 9
4.5.1 General ... 9
4.5.2 Operation qualification ... 9
4.6 Data quality and interpretation: Correlation analysis ... 10
4.6.1 Interpretation of correlograms ... 10
4.6.2 Interpretation of particle size distribution ... 12
4.6.3 Conversion from intensity to volume or number-based results ... 12
4.6.4 Influence of the observed scattering angle ... 13
4.6.5 How to judge good data quality ... 13
4.7 Data quality and interpretation: Frequency power spectrum analysis ... 14
4.7.1 Frequency power spectrum ... 14
4.7.2 Precision and run time ... 15
4.7.3 Sample quality ... 16
4.8 Method robustness ... 18
4.8.1 Robustness ... 18
4.8.2 Ruggedness ... 18
4.8.3 Investigation of these parameters ... 18
Bibliography ... **21**

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Foreword

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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).

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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.

This document was prepared by Technical Committee ISO/TC 24, *Particle characterization including sieving*, Subcommittee SC 4, *Particle characterization*.

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.

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Introduction

Dynamic light scattering (DLS) is a widely used technique for the characterization of particles with equivalent hydrodynamic diameters below a few micrometres. Modern instruments allow users with minimal training or background to use this technique. The downside is that not all users are familiar with the potential pitfalls, limitations and proper interpretation of results for DLS.

Therefore, this document has been developed as a guidance for good practice in DLS and complements ISO 22412:2017.

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Good practice for dynamic light scattering (DLS) measurements

1 Scope

This document provides practical guidance for performing and interpreting measurements using dynamic light scattering (DLS) that goes beyond the treatment of measurement artefacts in ISO 22412:2017.

This document is intended to help users with experiments planning, in particular with respect to obtaining the necessary information on the sample and deciding whether DLS is the most appropriate method. It provides information on how to prepare samples in an appropriate way, verify the proper functioning of the instrument and interpret the data correctly, including ways to assess data quality.

This document focuses on the practical steps required to obtain DLS results of good quality, rather than on theoretical considerations, and covers not only the measurement of solid particles, but also emulsions and bubbles.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

No terms and definitions are listed in this document.

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/

4 Instrument types

4.1 General

A discussion on what constitutes good practices requires knowledge of the instrument type being considered. Different optical configurations require different adjustment to control the optical layout: different signal processing techniques require different techniques to allow for background conditions; different analysis techniques require different conditioning parameters of the processed signal. Two commonly applied variants are homodyne detection with correlation function processing (see ISO 22412:2017, 9.2) and heterodyne detection with frequency spectrum processing (see ISO 22412:2017, 9.3.

Additionally, good practice, as it relates to instrument type, also depends on the scattering angle used for the measurement. For instance large spurious particles generally scatter more power into forward angles than higher angles, so that samples measured in forward-scatter typically require significantly more care regarding the cleanliness of the cuvette used, prior to filling with sample, the filtering of the sample between the particle size distribution (PSD) of interest and unwanted large size fractions and the dispensing to waste of the first few drops of sample from a syringe filter to remove filter spoil. Additionally, the single-scattering relaxation time is known to be well approximated by higher order scattering from concentrated samples as the scattering angle approaches 180 °, thereby allowing the characterization in backscatter of concentrated samples, so long as bulk scattering losses through

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