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Determination of particle size distribution — Differential electrical mobility analysis for aerosol particles

Détermination de la distribution granulométrique — Analyse de mobilité électrique différentielle pour les particules d'aérosol

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 15900 was prepared by Technical Committee ISO/TC 24, *Particle characterization including sieving*, Subcommittee SC 4, *Particle characterization*.

Introduction

Differential electrical mobility classification and analysis of airborne particles has been widely used to measure a variety of aerosol particles ranging from nanometre-size to micrometre-size in the gas phase. In addition, the electrical mobility classification of charged particles can be used to generate mono-disperse particles of known size for calibration of other instruments. One notable feature of these techniques is that they are based on simple physical principles. The techniques have become important in many fields of aerosol science and technology, e.g. aerosol instrumentation, production of materials from aerosols, contamination control in the semiconductor industry, atmospheric aerosol science, characterization of engineered nanoparticles, and so on. However, in order to use electrical mobility classification and analysis correctly, several issues, such as the slip correction factor, the ion-aerosol attachment coefficients, the size-dependent charge distribution on aerosol particles and the method used for inversion of the measured mobility distribution to the aerosol size distribution, need due caution.

There is, therefore, a need to establish an International Standard for the use of differential electrical mobility analysis for classifying aerosol particles. Its purpose is to provide a methodology for adequate quality control in particle size and number concentration measurement with this method.

Determination of particle size distribution — Differential electrical mobility analysis for aerosol particles

1 Scope

This International Standard provides guidelines on the determination of aerosol particle size distribution by means of the analysis of electrical mobility of aerosol particles. This measurement is usually called “differential electrical mobility analysis for aerosol particles”. This analytical method is applicable to particle size measurements ranging from approximately 1 nm to 1 µm. This International Standard does not address the specific instrument design or the specific requirements of particle size distribution measurements for different applications, but includes the calculation method of uncertainty. In this International Standard, the complete system for carrying out differential electrical mobility analysis is referred to as DMAS (differential mobility analysing system), while the element within this system that classifies the particles according to their electrical mobility is referred to as DEMC (differential electrical mobility classifier).

NOTE For differential electrical mobility measurements relating to Road Vehicle applications, please refer to relevant national and international standards. ISO Technical Committee TC 22, *Road vehicles*, is responsible for developing International Standards relating to road vehicles, components and measurements.

2 Terms and definitions

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

2.1
aerosol
system of solid or liquid particles suspended in gas

2.2
attachment coefficient
attachment probability of ions and aerosol particles

2.3
bipolar charger
device to attain the equilibrium steady state of charging by exposing aerosol particles to both positive and negative ions within the device

2.4
charge neutralization
process that leaves the aerosol particles with a distribution of charges that is in equilibrium and makes the net charge of the aerosol nearly zero, which is usually achieved by exposing aerosol particles to an electrically neutral cloud of positive and negative gas charges

2.5
condensation particle counter
CPC
instrument that measures the particle number concentration of an aerosol

NOTE 1 The sizes of particles detected are usually smaller than several hundred nanometres and larger than a few nanometres.