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Methods for zeta potential determination — Streaming potential and streaming current methods for porous materials

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Foreword

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

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Introduction

There are several different types of porous materials, such as porous monoliths, porous particles, deposits of solid particles, etc. Each of these different types can require a special sample handling system. This document covers only those aspects of the measurement and interpretation of electrokinetic and electroacoustic phenomena that are common for all these types of porous materials.

The determination of the zeta potential in wetted porous materials is complicated by the fact that this parameter is not a directly measurable quantity. It is calculated from the measured electric signal (either current or potential) that is generated in the wetted porous material by the liquid moving under the influence of an applied pressure gradient. The theories used in the calculation will not be discussed in detail.

There are a number of situations where electrokinetic and electroacoustic measurements, without further interpretation, provide extremely useful and unequivocal information for technological purposes. The most important of these situations are:

a) identification of the isoelectric point by titration of the zeta potential against a potential determining ion (e.g. pH titration);

b) identification of the isoelectric point by titration with other reagents such as surfactants or polyelectrolytes;

c) identification of a saturation plateau in the adsorption indicating optimum dosage for a dispersing agent;

d) relative comparison of various porous materials with regard to their electric surface properties.

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Methods for zeta potential determination — Streaming potential and streaming current methods for porous materials

1 Scope

This document specifies methods for the zeta potential determination in porous materials that are saturated with a liquid where the pores are readily accessible. There is no restriction on the value of the zeta potential or on the porosity of the porous material. A pore is assumed to be on the scale of hundreds of micrometres or smaller without any restriction on pore geometry.

This document covers the applications of alternating current (AC) and direct current (DC) methods using aqueous media as wetting liquids.

This document is restricted to linear electrokinetic effects.

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 terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1 Terms related to the electric double layer and the zeta potential

3.1.1
Debye length
κ^{-1}
characteristic length of the *electric double layer* (3.1.2) in an electrolyte solution

Note 1 to entry: The Debye length is expressed in metres.

[SOURCE: ISO 13099-1:2012, 2.1.2, modified — In the Note to entry, "nanometres" has been changed to "metres".]

3.1.2
electric double layer
spatial distribution of electric charges that appears on and at the vicinity of the surface of an object when it is placed in contact with a liquid

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