MEASUREMENT AND INTERPRETATION OF ELECTROKINETIC PHENOMENA

Contributors

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Summary

In this report the recent progress in Electrokinetics has been revised in order to recommend practical rules for properly performing electrokinetic measurements, and interpreting their results in terms of simple, but also rigorous, criteria currently described in modern bibliography. It is emphasized that the zeta potential is a property of charged interfaces which should be independent of the technique used for its determination.

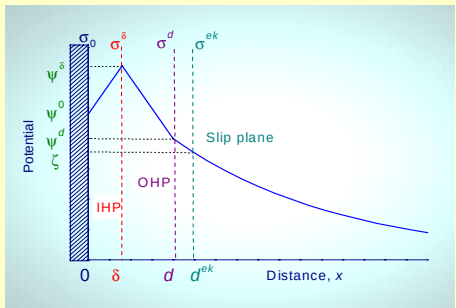
State of the Art

The Project was thoroughly discussed in the Electrokinetic Phenomena'2000 Meeting (Dresden, October 2000). Corerctions were found necessary, in order to reduce the theoretical load and stress the practical recommendations suitable to readers of any scientific qualification, potential users of electrokinetic techniques. A new document is already prepared and has been distributed to the members of the working party.

Overview of Contents

- General notions of Electrokinetics
- Elementary theories
- Discussion of individual phenomena:
  1. *Definitions. Symbols and nomenclature*
  2. *Relationship between measured quantities and the zeta potential*
  3. *Experimental techniques available*
- Critical analysis of the concept of zeta potential: true and "apparent" zeta
- Role of zeta potential in Colloid Science

Model description of the Electrical Double Layer



An example: Electrophoresis

$$v_e = u_e E$$

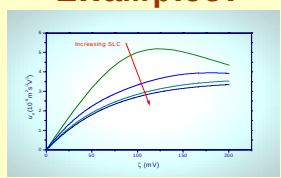
$$u_e = u_e(\zeta, \kappa a, Du^i)$$

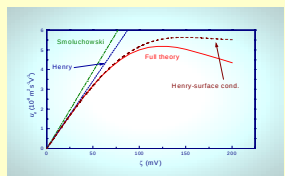
- Experimentally accesible quantities: u_e and κa
- If Du^i is negligible, ζ is the only determining parameter

How to proceed:

- If $\kappa a \gg 1$, then use thin-double layer theories
- Check for surface conductance: if it is negligible, use Smoluchowski's formula. Otherwise, correct for the effect of Du
- If ζ (apparent) is high, concentration polarization is significant: Smoluchowski's equation not valid
- If there is evidence for stagnant layer conductivity (SLC), a new parameter must be determined (Du^i)
- If $\kappa a \sim 1$, follow the same routine, but use numerical theories

Examples:





Expected progress of the Project:

- Deliver the revised version to all members of the working party
- Get their proposals, comments and queries
- Prepare a final version to be discussed at the next Electrokinetic Phenomena Meeting (Cracow, Poland'2002)
- Submit the Project to IUPAC

Poster prepared for the IUPAC Congress/General Assembly, *July 2001*