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Electrophoretic light scattering in ordered colloidal suspensions

M. Deggelmann[1]), T. Palberg[1]), P. Leiderer[1]), H. Versmold[2]) and R. Weber[1])

[1]) University of Konstanz, Konstanz, FRG
[2]) RWTH Aachen Inst. f. phys. Chem. II, Aachen, FRG

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Abstract: Electrophoretic light scattering (ELS) in the presence of electroosmosis is performed on PS- and PMMA-latex spheres with several experimental setups and different cell geometries. Theoretical expressions for the electrophoretic spectra and correlation functions are presented, which can be extended to include spectral broadening mechanisms.

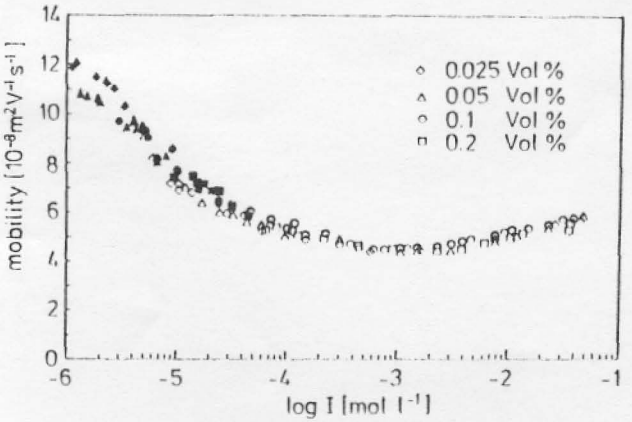

Fig. 1. Electrophoretic mobility versus total concentration of small ions for 100 nm PMMA-latex spheres at four different volume fractions. Filled symbols represent either fluid-like or crystalline ordered systems

For non-interacting systems both theory and data from all ELS experiments are found to be consistent and to agree quantitatively with data from conventional microelectrophoresis [1]. For interacting systems changes in the characteristic flow profile are reported. Though in these systems the theory cannot account for the exact intensity distribution of the ELS spectra, it still allows an evaluation of electrophoretic mobilities via depth dependent measurements. The mobility is found to increase dramatically from $3-5 \times 10^{-8}$ $m^2 V^{-1} s^{-1}$ to a maximum value of over 12×10^{-8} $m^2 V^{-1} s^{-1}$ as the total ion concentration, monitored via conductivity, is decreased from 10^{-5} mol l^{-1} to 6×10^{-7} mol l^{-1}. The values seem to be independent of particle number density and structure of the suspensions within the experimental error of ca. 5% [2].

References

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Authors' address:

Dr. T. Palberg
Universität Konstanz
Postfach 5560
D-7750 Konstanz, FRG