Comparability of zeta potential measurements of colloidal particles

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The optimisation of new particle based products with respect to their stability and physicochemical behaviour requires the characterisation of the interfacial properties. Such a characterisation may be achieved by means of the zeta potential, which is related to the surface charge and electric double layer (EDL) of colloidal particles. Furthermore, the zeta potential is a powerful parameter of the EDL. It describes the long-ranging repulsion between colloidal particles and is related to the suspension stability.

For the evaluation of zeta potential measurements it is important to understand that this quantity is not a fixed particle property, but depends on the chemical nature of particle, solvent and solutes and on their interaction. In concentrated suspension one should also regard the impact of the dispersed phase on the physico-chemical properties (e.g. ionic strength) of the dispersion medium. In addition, basic prerequisite of conventional electrokinetic or electroacoustic models may not be fulfilled for real-life products (e.g. regarding the ratio size to Debye length, surface conductivity or particle shape). It is for this reason, that the measurement of zeta potential encounters several experimental challenges, because each measurement technique possesses specific limits with regard to particle size and concentration. Moreover, the zeta potential measured by different instruments provides different values and one must consider their interpretation. A further aspect is that some measurement techniques provide distributions of the zeta potential, while others deliver average values for the particle population.

In our study we discuss the performance of two techniques for the measurement of zeta potential value [1]. This measurement encounters several experimental challenges, because each measurement technique possesses specific limits with regard to particle size, concentration and morphology. This study examines the comparability of zeta potential measurements by variation of mentioned specific limits taking account of the conservation of the chemical equilibrium.

 ISO 13099: Colloidal systems - Methods for Zetapotential determination -Part1: Electroacoustic and electrokinetic phenomena Part 2: Optical methods Part 3: Acoustic methods