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Generation of the streaming potential as a result of spherical particles motion

Zygmunt H. Zawada

The new capillary system for the measurements of the streaming potential of Chlorella vulgaris alga suspension was described. To eliminate the algae binding to the inner surface of glass capillary, the latter was coated with a lipid membrane that additionally neutralized a charge of glass. Since the diameter and the number of cells flowing through the capillary were well known, and because of small asymmetry of cells, the algae were chosen as a model of spherical particles. From the experimental data obtained, the surface potential Ψ_0, the surface charge density σ and the slipping layer thickness were calculated, according to the theoretical model of Zawada (1996, Gen. Physiol. Biophys. IS, 165173). The surface potential of the algae $\Psi_0 = +1.1 \pm 0.2$ mV and the slipping layer thickness $d = 2.1$ nm in the KCI electrolyte was determined. The addition of divalent cations (Zn^{+2}, Co^{+2}, Cu^{+2} or Cd^{+2}) to the algae suspension led to the increase of the surface potential about $10 \div 20$ times. The changes of the streaming potential with time stabilized after 7-9 minutes (especially for Co^{+2} and Cu^{+2} ions). This suggests that, apart from simple and fast ion adsorption, some ion-induced conformational changes of the surface polysaccharides or glycolipids may arise.