577f Colloidal Interactions in Mixtures of Symmetric and Asymmetric Electrolytes: a Monte Carlo Study

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Electrostatic interactions play an important role in many processes that involve charged particles and solid-liquid interfaces in a wide range of conditions of pH and ionic strength. Processes like adsorption, electrochemical reactions, ion transport through membranes, flocculation, deposition, and transport of colloidal particles in aqueous environments are governed by the strength and direction of the electrostatic forces acting on the particles and surfaces involved. The electrostatic forces result from the overlap of the electrical double layers (EDLs) associated to the interacting particles and solid surfaces. Previous simulation work of a discretely charged planar surface demonstrated that the size and charge of the counterions present in solution determine the structure of the EDL associated with it. A size exclusion effect could be consistently detected. This effect implied that smaller ions, bearing lower charge, preferentially accumulated close to the surface and screened the surface charge. In this work, Monte Carlo simulations are employed in the calculation of the interaction forces between a discretely charged planar surface and a charged colloidal particle in the presence of symmetric and asymmetric indifferent electrolytes. The forces are calculated as the summation of individual interactions between the surfaces and their associated EDLs. The force components perpendicular to the planar surface as a function of separation distance are presented for discussion.