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Surface Chemistry in Water Filtration: Modeling Electrokinetic Potential at the Soild/Water Interface

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As the particle and collector surfaces come close together, the electrical double layer (EDL) interaction force and the London-van der Waals (LVDW) force can be considered. The EDL interaction force can be calculated by using zeta potentials of the particle and collector. The zeta potential can be determined by the nature of the interfacial region between a solid and the bulk solution,and thus the EDL , which is determined by interactions between dissolved species and the solid surface.

In this study the effects of bulk solution chemistry on zeta potentials of the particle and collector were modeled using surface chemistry theories. The purpose of modeling the zeta potentials is to determined if the observed effects of bulk solution chemistry on zeta potentials are consistent with the predicted effects based on the division of electrostatic and specific chemical interaction effects as described by a particular surface complexation model.

The model development was limited in the diffuse layer(DL) and triple layer (TL) models. The models was calculated by using MINTEQA2 computer algorithm for the geochemical equilibrium speciation model in dilute aqueous system, varing with bulk solution chemistry.

The experimental data of the zeta potential of particle were measured by using microelectrophoresis technuque. The experimental data of the zeta potential of collector were calculated by using the data measured by streaming potential technique.

The observed effects of variations in bulk solution chemistry on zeta potentials of the particle and collector could be described adequately using both the diffuse layer and triple layer surface complexation models. Based on the use of consistent parameter values over a broad range of chemical conditions used in this study , the zeta potentials computed by using the DL model was as accurate as those using the TL model.

The surface complexation model provides a useful basis for examining serveral processes such as particle deposition in deep bed filtration, particle transport in groundwaters, coagulation, sludge dewatering, and the fate of particle-reactive pollutants in natural waters.