

Polyelectrolyte Coating of Nanoparticles for Subsurface Applications

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Over the past decade, the interest in exploiting nanotechnology in high salinity media including seawater and brines relevant to environmental science and subsurface oil/gas reservoirs has grown markedly. In such media with high ionic strengths, the electrostatic repulsion between the nanoparticles (NPs) becomes very weak, often leading to immediate aggregation and precipitation of the particles. Herein, we present a variety of strategies to permanently graft water-soluble polyelectrolytes onto NP surfaces in order to overcome the unique challenges associated with NP stabilization in high salinity media. We show that the polyelectrolyte-grafted NPs not only display colloidal stability in high salinity and high temperature environment, but also resist undesirable adsorption on model mineral surfaces.