

A Study on Silica Nanoparticles Grafted with Anionic Polyelectrolytes as Pickering Emulsifiers of Oil and High Salinity Aqueous Solutions

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Nanoparticles (NPs) may have great potential for various subsurface applications over the past decades. One of the important challenges for these applications is to achieve colloidal stability in subsurface media at high salinity and high temperature. It has been previously shown that NPs “multipoint”-grafted with anionic poly(AMPS-co-AA) exhibited remarkable colloidal stabilities in certain salinity such as API brine. However, many other important properties of such particles still remain unstudied. Herein, we investigate various properties of the silica (SiO₂) NPs “multipoint”-grafted with poly(AMPS-co-AA) in NaCl and CaCl₂ solutions. The brush behavior of the grafted random copolymers was investigated through wide range of salinities. The particles displayed brine-oil interfacial activity with increasing salt concentrations (C_s), stabilizing oil-in-brine emulsions. High internal phase emulsion (HIPE) could be formed in high C_s of CaCl₂, which exhibited gel-like behavior.