A study on silica nanoparticles (NPs) grafted with poly(2-acrylamido-2-methyl-1-propanesulfonate-co-acrylic acid, AMPS-co-AA) as Pickering emulsifiers of oil and high salinity aqueous solutions

박현수, 임세형, 양지원, 곽채수, 김지은, 김지은, 이주형†
명지대학교
(ljro@mju.ac.kr†)

One of the important challenges for NPs to be used in down-hole applications is to achieve colloidal stability in high salinity and high temperature conditions of subsurface media. It has been previously shown that a number of functional NPs grafted with anionic poly(AMPS-co-AA) exhibited a remarkable colloidal stability in standard American Petroleum Institute brine (API brine; NaCl 8 wt.% + CaCl2 2 wt.%). However, several important properties of such particles other than the colloidal stability were not studied in a systematic fashion for a wide range of salt concentrations (Cs). Herein, we investigate silica NPs grafted with poly(AMPS-co-AA), SiO2-g-poly(AMPS-co-AA), in NaCl and CaCl2 solutions from low Cs up to extreme salinities. The SiO2-g-poly(AMPS-co-AA) NPs were found to have interfacial activity with the nonpolar oils, allowing the NPs to successfully stabilize oil-in-water emulsion, even the one with a high internal oil phase (up to 80 vol.%). Thus, these NPs may be considered as a useful Pickering emulsifier in high salinity conditions.