603c Controlling Calcium Carbonate Crystallization with Carboxylic Acid Containing Polymer Adsorbates

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Certain carboxylic acid-containing polymers such poly(acrylic acid), poly(maleic acid) and co- and terpolymers containing acrylic and maleic acid monomers have found widespread application for preventing the formation crystalline deposits that can foul heat exchanger surfaces and inhibit transport through membranes, screens and conduits. Inhibition of deposit formation can result from both solution phase complexation between polymers and dissolved metals and interfacial interactions of polymers with developing nuclei and crystals to impede nucleation and growth kinetics. In this presentation, data are presented that outline the role of polymer concentration, molecular weight and acid group content in determining the inhibition performance for various carboxylic acid containing polyelectrolye samples. Nucleation and growth are monitored in-situ using FBRM (Focused Beam Reflectance Measurement) and QCM (Quartz Crystals Microbalance) gravimetery, and the resulting crystals are characterized using scanning probe microscopy and x-ray diffraction. Data demonstrate the importance of molecular weight distributions and certain structural characteristics for inhibiting nucleation, growth and modifying crystal morphology. The results indicate a primary role of interfacial adsorption in controlling processes that lead to crystalline deposits.