



Research on dynamic synergistic scale inhibition performance and mechanisms of ESA/IA/AMPS copolymer with electrostatic field

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ABSTRACT

Dynamic scale inhibition of epoxysuccinic acid/itaconic acid/2-acrylamido-2-methyl propanesulfonic acid (ESA/IA/AMPS) copolymer with electrostatic field was studied via a dynamic simulation device. CaCO_3 morphology and crystal form were characterized by scanning electron microscope (SEM) and X-ray diffraction (XRD). The results show an obvious synergistic effect between the electrostatic field and ESA/IA/AMPS copolymer in a dynamic scale inhibition test. The synergism scale inhibition rate was 95.85%, which is 12.94% higher when compared with the copolymer alone. SEM and XRD analyses indicate that the electrostatic field facilitated the formation of aragonite CaCO_3 . CaCO_3 scale formation in a blank water sample consisted of 83.8% calcite and 16.2% aragonite, while CaCO_3 scale formation from a water sample treated with an electrostatic field consisted of 95.5% aragonite and 4.5% calcite. The CaCO_3 scale formed in the presence of the copolymer and formed under the synergistic effect both consisted of 100% aragonite. However, CaCO_3 crystal particles that formed under the synergistic effect were much smaller and more dispersed.

Keywords: Dynamic scale inhibition; ESA/IA/AMPS copolymer; Electrostatic field; Synergism; CaCO_3 crystal form

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