Synthesis and properties of a MEAS quadripolymer scale inhibitor

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ABSTRACT

A novel quadripolymer scale inhibitor was prepared from maleic anhydride (MA), epoxy succinic acid sodium (ESAS), acrylamide (AM) and sodium allyl sulphonate (SAS), and the polymerisation was initiated by persulphate ammonium. This study determined the optimal synthesis conditions for the scale inhibitor by the orthogonal test, and investigated scale inhibitor dosage, systematic pH values and temperature on the scale inhibitor anti-scaling properties. The results showed that the optimal conditions of synthesis were as follows: the mass ratio of persulphate ammonium to total monomer was 15%, the monomer molar ratio for n(MA):n(ESAS):n(AM):(SAS) was 1:1:0.6:1, the reaction temperature was 90˚C and the reaction time was 3 h. When the temperature was 50˚C, the pH value was 10, the scale inhibitor dosage was 20 mg/L and the calcium carbonate anti-scaling rate was 96%. The infrared spectra indicated that the synthetic copolymer contained the target functional groups. Scanning electron micrographs showed that the quadripolymer scale inhibitor mainly played roles in complexation and solubilisation. The practical application of the inhibitor led to an improved anti-scaling effect.

Keywords: Copolymer; Orthogonal test; Scale inhibitors; Calcium carbonate

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