

Experimental investigation of scaling control by a non-phosphorous polymer: polyaspartic acid

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ABSTRACT

Environmental issues lead to study the effect of environmentally-friendly additives without phosphorous to prevent scaling in desalination plants. In this way, the role of polyaspartic acid on the crystallization of calcium carbonate in seawater was investigated. An experimental procedure permitted to follow in situ and in real-time the growth of scale particles in the micrometric range and experimental results were fitted with a mathematical model based on a diffusion-controlled process that allows determining the kinetic parameters of crystallization. The results showed that polyaspartic acid may strongly influence the nucleation/growth process. At a concentration of 1 ppm, it reduces the surface coverage of deposits on the substrate by decreasing the micronic particles. At a concentration of 4 ppm added at the start of the experiment, it strongly inhibits the development of crystals, the lateral growth rate was almost zero and the effect of the additive was close to phosphino polycarboxylic acid. When the macromolecule was added after 10 min of experiment, it highly decreased the growth of crystals. The role of this additive in affecting the crystallization is discussed in relation to the principal mechanisms by which it acts in comparison with other additives.

Keywords: Green additive; Crystallization; Growth; Calcium carbonate; PASP

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