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Modeling the effect of anti-scalant on $CaCO_3$ precipitation in continuous flow

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ABSTRACT

Scale inhibition by anti-scalants is known to involve blockage of active growth sites by adsorbed inhibitor molecules, but there is virtually no quantitative information on the kinetics of anti-scalant retarded precipitation. This paper presents a model integrating the process of anti-scalant adsorption on precipitated $CaCO_3$ particles with the kinetics of the ensuing retarded precipitation. Adsorption is analyzed according to the Langmuir, Freundlich and Langmuir–Freundlich models, and $CaCO_3$ precipitation is described by the commonly used surface reaction controlled model. The proposed model is validated by experimental data measured in a continuous flow precipitation system over a wide range of conditions.

Keywords: $CaCO_3$ precipitation; Anti-scalants; Scale inhibition; Adsorption isotherms; Kinetics

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