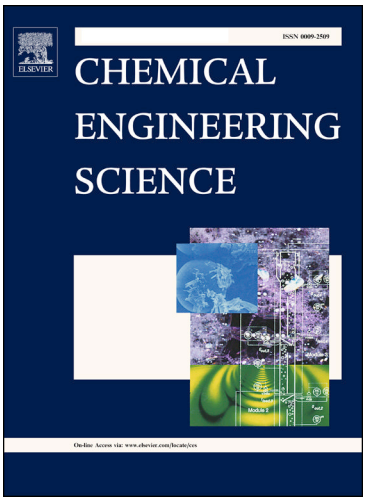

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Reactive absorption of CO_2 in NaOH: An Euler-Euler simulation study

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Abstract

Recently, a new model for the reactive mass transfer during absorption of CO_2 in aqueous NaOH was developed, based on using a rather generally applicable expression for the enhancement factor and taking into account the reaction of CO_2 with water in addition to that with hydroxide ions [Krauß and Rzehak, Chemical Engineering Science 166 (2017) 193–209]. By substituting the interfacial area concentration estimated from experimental data, good agreement was found for the pointwise measurement of time-dependent pH-value in a bubble column taken from the literature [Darmana et al., Chemical Engineering Science 62 (2007), 2556–2575]. In the present contribution, this mass transfer model is implemented in an Euler-Euler / RANS framework including also the hydrodynamic part of the problem. Hydrodynamic closures were taken the same as applied successfully for a range of different conditions in previous work. However, the accuracy of the coupled model in predicting the measured pH-value is seen to fall behind that of the simple pointwise approximation. This suggests that for the present application, the hydrodynamic part of the model requires further improvement. Possible directions to this end are discussed.

Keywords: mass transfer, chemical reaction, chemisorption, enhancement factor, dispersed gas-liquid multiphase flow, Euler-Euler two-fluid model, CFD simulation

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