

Accepted Manuscript

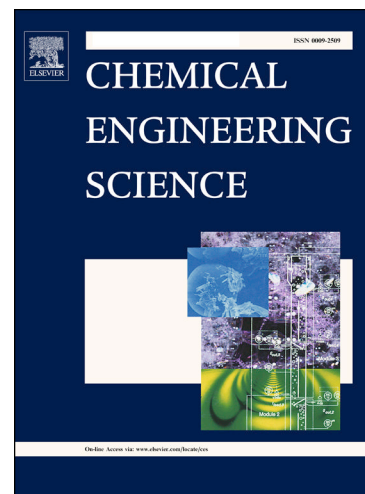
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Manuel Krauß, Roland Rzehak

PII: S0009-2509(18)30009-5
DOI: <https://doi.org/10.1016/j.ces.2018.01.009>
Reference: CES 13995

To appear in: *Chemical Engineering Science*

Received Date: 27 June 2017
Revised Date: 1 December 2017
Accepted Date: 7 January 2018



Please cite this article as: M. Krauß, R. Rzehak, Reactive absorption of CO₂ in NaOH: An Euler-Euler simulation study, *Chemical Engineering Science* (2018), doi: <https://doi.org/10.1016/j.ces.2018.01.009>

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Reactive absorption of CO₂ in NaOH:
An Euler-Euler simulation study

Manuel Krauß^{1,2}, Roland Rzehak^{1*}

¹ Helmholtz-Zentrum Dresden – Rossendorf, Institute of Fluid Dynamics,
Bautzner Landstrasse 400, D-01328 Dresden, Germany

² Technische Universität Dresden, Chair of Chemical Reaction Engineering and Process
Plant, Münchnerplatz 3, D-01062 Dresden, Germany

Abstract

Recently, a new model for the reactive mass transfer during absorption of CO₂ in aqueous NaOH was developed, based on using a rather generally applicable expression for the enhancement factor and taking into account the reaction of CO₂ 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

* Corresponding author email: r.rzehak@hzdr.de

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