

Accepted Manuscript

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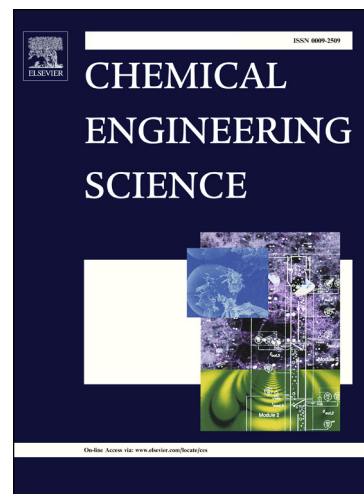
PII: S0009-2509(17)30036-2
DOI: <http://dx.doi.org/10.1016/j.ces.2017.01.017>
Reference: CES 13363

To appear in: *Chemical Engineering Science*

Received Date: 30 June 2016
Revised Date: 31 October 2016
Accepted Date: 9 January 2017

Please cite this article as: S. Kutup Kurt, F. Warnebold, K.D.P. Nigam, N. Kockmann, Gas-Liquid Reaction and Mass Transfer in Microstructured Coiled Flow Inverter, *Chemical Engineering Science* (2017), doi: <http://dx.doi.org/10.1016/j.ces.2017.01.017>

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Gas-Liquid Reaction and Mass Transfer in Microstructured Coiled Flow InverterSafa Kutup Kurt^{1*}, F. Warnebold¹, Krishna D. P. Nigam², Norbert Kockmann¹

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Abstract

Microstructured coiled flow inverter (MCFI) as a helically coiled tubular device with 90° alternating bends provides enhanced radial mixing due to secondary flow (Dean vortices) in different planes. Liquid-liquid mass transfer characterization in MCFI revealed higher mass transfer rates compared to other capillary setups. However, the influence of Dean vortices and 90° bends on gas-liquid mass transfer has not been investigated and described yet. Different reactor setups, i.e. MCFI, straight capillary, helical coil, and bend reactor were fabricated from FEP tubes (ID = 1 mm). Gas-liquid mass transfer performance was investigated for a gas-liquid reaction system, i.e. cobalt (II) catalyzed air oxidation of sodium sulfite. Two-phase slug flow hydrodynamics and pressure drop were experimentally characterized, while influence of operating and geometrical reactor parameters on conversion was investigated for reactor setups. MCFI offers up to 14 % higher conversion in comparison to other capillary setups. Mixing within the liquid phase is enhanced by the formation of Dean vortices and additional direction change via 90° bends, which contribute to the internal diffusion in the liquid phase.

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