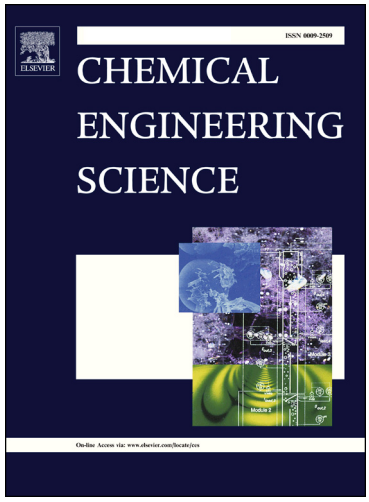

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Gas-Liquid Reaction and Mass Transfer in Microstructured Coiled Flow Inverter

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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.