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PII: S1385-8947(18)31415-3
DOI: https://doi.org/10.1016/j.cej.2018.07.166
Reference: CEJ 19564

To appear in: *Chemical Engineering Journal*

Received Date: 1 June 2018
Revised Date: 23 July 2018
Accepted Date: 25 July 2018

Please cite this article as: Y. Song, J. Song, M. Shang, W. Xu, S. Liu, B. Wang, Q. Lu, Y. Su, Hydrodynamics and mass transfer performance during the chemical oxidative polymerization of aniline in microreactors, *Chemical Engineering Journal* (2018), doi: https://doi.org/10.1016/j.cej.2018.07.166

Hydrodynamics and mass transfer performance during the chemical oxidative polymerization of aniline in microreactors

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Abstract

The hydrodynamics and mass transfer performance in the chemical oxidative polymerization of aniline in capillary microreactors within the liquid-liquid slug flow regime were investigated. Higher reaction temperature, higher HCl concentration and larger volumetric flow rate ratio of the aqueous phase to the organic phase improved the mass transfer performance and thus led to higher yield of polyaniline. Internal recirculation in the dispersed phase slugs was captured by high-speed camera, which was beneficial for the mass transfer enhancement in the polymerization process. The polyaniline yield reached 82.1% in the microreactor at the residence time of 95 s and the temperature of 40 ^{o}C. The slug coalescence became significant with increasing Reynolds number, thus reducing the mass transfer rate. Moreover, both Hatta number and mass transfer enhancement factor were evaluated to further characterize the mass

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