

Accepted Manuscript

Continuous emulsion copolymerization processes at mild conditions in a 3d-printed tubular bended reactor

Sven Bettermann, Baldur Schroeter, Hans-Ulrich Moritz, Werner Pauer, Marcel Fassbender, Gerrit A. Luinstra

PII: S1385-8947(18)30039-1
DOI: <https://doi.org/10.1016/j.cej.2018.01.038>
Reference: CEJ 18358

To appear in: *Chemical Engineering Journal*

Received Date: 25 September 2017
Revised Date: 5 January 2018
Accepted Date: 6 January 2018

Please cite this article as: S. Bettermann, B. Schroeter, H-U. Moritz, W. Pauer, M. Fassbender, G.A. Luinstra, Continuous emulsion copolymerization processes at mild conditions in a 3d-printed tubular bended reactor, *Chemical Engineering Journal* (2018), doi: <https://doi.org/10.1016/j.cej.2018.01.038>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



CONTINUOUS EMULSION COPOLYMERIZATION PROCESSES AT MILD CONDITIONS IN A 3D-PRINTED TUBULAR BENDED REACTOR

Sven Bettermann, Baldur Schroeter, Hans-Ulrich Moritz, Werner Pauer

Marcel Fassbender, Gerrit A. Luinstra

*Institute for Technical and Macromolecular Chemistry, University of Hamburg,
Bundesstraße 45, 20146 Hamburg, Germany*

HIGHLIGHTS

- Suitable and inexpensive tubular bended reactor was 3D-printed.
- Geometry led to short and narrow residence time distribution with low dead volumes.
- First redox-initiated continuous emulsion copolymerizations in a 3D-printed reactor.
- Stable continuous operation leading with grade transition to uniform and adjustable products.
- Visualization of polymerization processes by thermal imaging.

ABSTRACT

A polylactic acid tubular bended reactor, printed by fused deposition modeling with a short and narrow residence time distribution, air-cooled, and with dead volumes below 5 vol% was integrated into a modular reaction system enabling product changes in the running system. Continuous, redox-initiated emulsion copolymerizations of styrene - butyl acrylate and of vinyl acetate - neodecanoic acid vinyl ester were successfully performed with 20 and 40 wt% monomer in the feed. Copolymerizations had an ambient starting temperature with a mean residence time of 5 and 15 min, conversions were between 81 and 99%. The resulting emulsions were stable with Zeta potential values up to -132.0 mV and no product adhesion to the reactor wall was found. A stable steady state of the reaction plant was also obvious from thermal imaging, showing an invariant temperature profile along the 3D-printed reactor. The

Download English Version:

<https://daneshyari.com/en/article/6580310>

Download Persian Version:

<https://daneshyari.com/article/6580310>

[Daneshyari.com](https://daneshyari.com)