Pulse Flow in Solid Foam Packed Reactors: Analysis of Morphology and Key Characteristics

Johannes Zalucky, Tobias Claußnitzer, Markus Schubert, Rüdiger Lange, Uwe Hampel

PII: S1385-8947(16)31173-1
DOI: http://dx.doi.org/10.1016/j.cej.2016.08.091
Reference: CEJ 15657

To appear in: *Chemical Engineering Journal*

Received Date: 10 May 2016
Revised Date: 30 June 2016
Accepted Date: 19 August 2016

Please cite this article as: J. Zalucky, T. Claußnitzer, M. Schubert, R. Lange, U. Hampel, Pulse Flow in Solid Foam Packed Reactors: Analysis of Morphology and Key Characteristics, *Chemical Engineering Journal* (2016), doi: http://dx.doi.org/10.1016/j.cej.2016.08.091

Pulse Flow in Solid Foam Packed Reactors: Analysis of Morphology and Key Characteristics

Johannes Zalucky[a], Tobias Claußnitzer[a], Markus Schubert[a,*], Rüdiger Lange[b], Uwe Hampel[a,c]

[a]*Institute of Fluid Dynamics, Helmholtz-Zentrum Dresden-Rossendorf, Bautzner Landstraße 400, 01328 Dresden, Germany*

[b]*Chair of Chemical Engineering and Process Plants, Technische Universität Dresden, 01062 Dresden, Germany*

[c]*AREVA Endowed Chair of Imaging Techniques in Energy and Process Engineering, Technische Universität Dresden, 01062 Dresden, Germany*

[*]Corresponding author: m.schubert@hzdr.de

In this paper, results of an experimental study on pulsing two-phase flow in SiSiC solid foam packed reactors are presented. Thereby, the pulse characteristics were investigated in a wide range of water and air fluxes at different axial positions for foams with pore densities of 20, 30, and 45 ppi were investigated using ultrafast X-ray computed tomography. Basis pulse shapes were perceived as discs, curtains and bowls, which occurred randomly. The key characteristics, i.e. frequency, velocity and volume of pulses as well as peak and time-averaged liquid holdup, have been extracted by applying a dynamic threshold criterion to time-variant liquid holdup profiles. The key properties strongly depend on axial position, pore density and fluid fluxes and can be distinguished in a local and global mode of pulsing. In the local mode, which evolves close to the regime transition boundary, pulses with small liquid volumes move slowly but frequently through the solid foam packed reactor. However, significantly faster pulses with large liquid volumes were encountered in the global mode. The larger pulses cover most of the reactor's