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Conditioning Micro Fluidized Bed for Maximal Approach of Gas Plug Flow

Sulong Geng[a,b], Zhennan Han[c], Jurong Yue[a], Yunjia Li[a, b], Xi Zeng[a], Dengguo Lai[a,b], JianYu[a,*], Guangwen Xu[a,c*]

[a] State Key Laboratory of Multi-phase Complex Systems, Institute of Process Engineering, Chinese Academy of Sciences, Beijing 100190, China.

[b] University of Chinese Academy of Sciences, Beijing 100049, China.

[c] Institute of Industrial Chemistry and Energy Technology, Shenyang University of Chemical Technology, Shenyang 110142, China.

* Corresponding Authors, Tel: +86 10 82544886, Fax: +86 10 82629912. *E-mails: yujian@ipe.ac.cn (J. Yu); gwxu@syuct.edu.cn.*

Abstract

We have for the first time investigated the gas-solid fluidization behavior in size-reduced beds called micro fluidized bed (Liu. X *et al. Chem. Eng. J*., 2008, 137: 302-307), but up to now there is not yet any clear definition for the micro fluidized beds (MFBs). This study intends to characterize MFBs in terms of gas back-mixing. The residence time distribution (RTD) and extent of back-mixing of gas were investigated in beds with inner diameters of up to 21 mm for particles of FCC, glass beads and silica sand. The RTD curves of gas, shown as E(t) versus time t, in such beds were determined on the basis of axial dispersion model to obtaine the mean residence time $\bar{t}$, variance σ_t^2 and peak height of a given E(t) curve. In terms of these parameters the degree of gas back-mixing and its variation were evaluated with respect to particles, bed diameter (D), superficial gas velocity (U_g) and static particle bed height (H_s). It was found that the RTD of gas is subject to an unique correlation between the height of E(t) peak and the variance σ_t^2, which makes it clear that the gas flow in an MFB has limited gas dispersion and is highly approaching to a plug flow if σ_t^2 is below 0.25 or the height of E(t) peak is larger than 1.0. This refers to the feature that is most desired for an MFB and can thus be the criterion for defining MFB.

Keywords: *Micro fluidized bed; Residence time distribution; Axial dispersion model; Gas back-mixing; Plug flow.*