

Accepted Manuscript

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PII: S1385-8947(18)31223-3
DOI: <https://doi.org/10.1016/j.cej.2018.06.177>
Reference: CEJ 19388

To appear in: *Chemical Engineering Journal*

Received Date: 9 May 2018
Revised Date: 26 June 2018
Accepted Date: 27 June 2018

Please cite this article as: G. Wu, Y. He, W. Chen, Hydrodynamics of activated char in a novel multistage circulating fluidized bed for dry desulfurization, *Chemical Engineering Journal* (2018), doi: <https://doi.org/10.1016/j.cej.2018.06.177>



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Hydrodynamics of activated char in a novel multistage circulating fluidized bed for dry desulfurization

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Abstract

A novel multistage fluidized bed was proposed to improve the desulfurization efficiency of activated char in a circulating fluidized bed–flue gas desulfurization process. The hydrodynamics of gas–solid flow in the multistage fluidized bed was experimentally studied. Results showed that the overall pressure drop of the bed had a good linear relationship with the ratio of the superficial gas velocity and the solid circulation rate. Compared with the conventional fluidized bed for desulfurization, a relatively uniform upward flow over a cross section was observed in the middle conveying section of the multistage fluidized bed. Intensive gas–solid interaction in the expanding section of the multistage fluidized bed was confirmed. In addition, a uniform suspension upward flow with minimal solid backmixing at the upper portion of the expanding section was observed under limited operating conditions. Finally, the gas–solid flow structure in the expanding section of the multistage fluidized bed was depicted.

Keywords: circulating fluidized bed; gas–solid flow; suspension upflow; char; dry desulfurization

Nomenclature

G_s solid circulation rate ($\text{kg}/\text{m}^2\text{s}$)

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