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Effect of flow and module configuration on SO_2 absorption by using membrane contactors (Article)

Zhang, Z.[a,b,c], Zhao, S.[a], Rezakazemi, M.[d], Chen, F.[b], Luis, P.[e], van der Bruggen, B.[f]

Save all to author list

[a]School of Chemistry and Chemical Engineering, Chongqing University of Technology, Chongqing, 400054, China
[b]Fujian Provincial Key Laboratory of Featured Materials in Biochemical Industry, Ningde Normal University, Ningde, 352100, China
[c]Key Laboratory of Low-grade Energy Utilization Technologies and Systems, Ministry of Education of China,

Chongqing University, Chongqing, 400044, China
[d]Department of Chemical and Materials Engineering, Shahrood University of Technology, Shahrood, Iran
[e]Materials & Process Engineering (iMMC-IMAP), Université catholique de Louvain, Louvain-la-Neuve, 1348, Belgium
[f]Department of Chemical Engineering, ProcESS, KU Leuven, W. de Croylaan 46, Leuven, B-3001, Belgium

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Abstract

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Sulfur dioxide (SO_2) emissions lead to negative environmental impacts and it is considered as an indicator for the larger group of gaseous sulfur oxides (SO_x) in the air. In this paper, the dimethylamine (DMA) solution was used as the absorbent in a α-Al_2O_3 hollow fiber membrane contactor that is operated under several conditions of gas velocity, liquid velocity, and 290 K operating temperature. The effects of gas and liquid phase properties and module configuration on SO_2 absorption efficiency in the hollow fiber membrane contactor were investigated. Simulation results showed that the changes of gas phase velocity, liquid phase velocity, and concentration have great influences on the absorption efficiency of SO_2. An increase of the gas flow rate decreases the SO_2 absorption efficiency, while an increase of the liquid flow rate has the opposite effect, increasing the efficiency. Because gas in the membrane module stays for a longer time, more absorption time promotes the gas and liquid reaction. However, the changes of the volume fraction of SO_2 in the mixed gas are not significant to SO_2 absorption. The simulation model could provide guidelines for selecting suitable fluid properties during the SO_2 absorption process in a hollow fiber membrane contactor. © 2017 Global NEST.

SciVal Topic Prominence

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Received: 13/02/2017, Accepted: 02/01/2018, Available online: 17/01/2018 *to whom all correspondence should be addressed: e-mail: zhienzhang@hotmail.com

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Zhang, Z.; School of Chemistry and Chemical Engineering, Chongqing University of Technology, Chongqing, China; email:zhienzhang@hotmail.com

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