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Short communication

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Analysis of inter-particle dilution effects in a catalytic packed bed reactor**Mayank Tanwar¹, Divesh Bhatia^{1*}, Michael P. Harold^{2*}**

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Abstract

The widely used Koros-Nowak criterion and Madon-Boudart test which are based on intra-particle dilution effects have been extended by various researchers to study inter-particle dilution effects. In this work, numerical simulations are performed to investigate the inter-particle dilution effects in a packed bed containing catalyst and inert particles. It is shown that if the turnover rate is found to be independent of the inter-particle dilution ratio, it does not necessarily imply that the diffusional limitations are absent, i.e., if the Madon-Boudart test which was originally developed on the basis of intra-particle dilution is used to study inter-particle dilution effects, the results could be error prone. We show that a straight line with a slope of 1 on a log-log scale between the reaction rate and the weight of the catalyst, or a constant turnover rate with respect to catalyst particle number density does not always imply that the diffusional limitations are absent. It is also emphasized that maintaining low conversions does not always ensure the absence of diffusional limitations.

Keywords: Madon-Boudart criteria; intra-particle dilution; inter-particle dilution; diffusional limitations; kinetic regime; transport effects

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