

Acquiring real kinetics of reactions in inhibitory atmosphere containing product gases using micro fluidized bed

Xuejing Liu¹, Wenqian Hao¹, Kexin Wang¹, Yingche Wang¹, Ping An¹, Hong Zhang¹, Junrong Yue², Dingrong Bai¹, and Guangwen Xu¹

¹Shenyang University of Chemical Technology

²Institute of Process Engineering Chinese Academy of Sciences

November 4, 2020

Abstract

The study proposed an isotopes-tagging method for investigation of reactions under the atmosphere of product gas. To illustrate this method, the calcination kinetics of calcium carbonate CaCO_3 in CO_2 atmospheres were investigated by monitoring $^{13}\text{CO}_2$ produced using a micro fluidized bed reaction analyzer (MFBRA). The results demonstrated that the presence of CO_2 in the reaction atmosphere increases the apparent activation energy. The increase in the apparent activation energy is, however, significantly overestimated by the TGA because of the excessive suppression by stagnated product gas inside the sample crucible. Comparatively, the results from the MFBRA are due primarily to the thermal equilibrium limitation, because the gas diffusion in the MFBRA is essentially eliminated. It is thus concluded that the MFBRA is quite capable of acquiring the real kinetics of reactions in such inhibitory atmospheres.

Hosted file

revised manuscript-marked.pdf available at <https://authorea.com/users/372868/articles/490732-acquiring-real-kinetics-of-reactions-in-inhibitory-atmosphere-containing-product-gases-using-micro-fluidized-bed>

Hosted file

revised manuscript-clear.pdf available at <https://authorea.com/users/372868/articles/490732-acquiring-real-kinetics-of-reactions-in-inhibitory-atmosphere-containing-product-gases-using-micro-fluidized-bed>