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Moisture swing adsorption on the metal organic framework UiO-66 for ambient carbon dioxide capture

Mitchell Armstrong
Arizona State University, USA

Moisture swing adsorption is a novel process in which changes in humidity are used to switch between adsorption/desorption of select gases instead of more traditional pressure or temperature swings. The highly studied metal-organic-framework UiO-66 has demonstrated the ability to collect carbon dioxide from ambient air through a moisture swing process in which carbon dioxide is captured at low ambient conditions and collected in moisture rich conditions.

mrarmst2@asu.edu

Improved dynamic model for ethylene co-polymerization in industrial gas phase fluidized bed reactors

Mohammad Reza Abbasi[1], **Mohamed Azlan Hussain**[1] and **Ahmad Shamiri**[2]
[1]University of Malaya, Malaysia
[2]UCSI University, Malaysia

Polyolefins (PO) are utilized in numerous applications nowadays. Gas phase fluidized bed reactors (FBR) using heterogeneous Ziegler–Natta catalysts has remained the main process for olefin polymerization. Capability to carry different chemical reactions, good particle mixing and high rate of heat and mass transfer are among the advantages of the FBRs. Although using fluidized bed reactors in gas-phase olefin polymerization have been around for few decades in history, the multifaceted interaction between reaction kinetics, hydrodynamics, and heat and mass transfer is not yet fully understood and still remains a challenge. Therefore, to optimally design and operate such reactors, it is vital to comprehend the fundamental phenomena that take place in gas-phase fluidized-bed reactors. In this study, a dynamic model for ethylene copolymerization in an industrial fluidized-bed reactor is developed to describe its behavior and calculate the properties of polyethylene. The presented model considers particle entrainment and polymerization reaction in two phases. The combination of two-site kinetic and hydrodynamic models, provide a comprehensive model for the gas phase fluidized-bed polyethylene production reactor. The governing moment and hydrodynamic differential equations were solved simultaneously and the results were compared with literature, as well as industrial data. The dynamic model showed realistic results for predicting polydispersity index (PDI), molecular weight distribution (MWD) and more accurate results for reactor temperature and polymer production rate.

mrabbasi.ms@gmail.com