Parameter estimation of the PSA process using the dynamic responses of bed temperatures

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With the concern about global warming, CO2 capture and sequestration has been widely and intensely studied over the last two decades. In particular, the technologies of capturing CO2 from fossil fuel combustion gas using adsorption processes, which are commercialized as PSA processes, have been widely studied as one of the potentially viable process options. In this study, a method to accurately estimate the rate parameters of a PSA process such as LDF constants and effective diffusivity has been proposed and applied to an experimental PSA process for CO2 capturing using zeolite 13X. The method is based on the dynamic responses of bed temperatures during CO2 adsorption and desorption together with the breakthrough curve information. For this, how the process parameters have effects on the dynamic responses was investigated first using a numerical simulator and a method to relate key features of the dynamic responses to the process parameters has been proposed and experimentally applied.