# Performance Evaluation of Temperature Swing Adsorption and Pressure Swing Adsorption Processes at Cyclic Steady State

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In this work, mathematical modeling of the cyclic steady states of pressure swing adsorption (PSA) and temperature swing adsorption (TSA) processes are carried out to evaluate their suitability for post-combustion $CO_2$ capture. Both PSA and TSA are well-known adsorption processes being considered for the adsorption-based post-combustion $CO_2$ capture from the flue gas. However, most previous studies have focused on modeling and optimization of individual processes and have not evaluated their relative merits for a given adsorbent. To reflect the working efficiency of the process, the performance criteria used for the evaluation should include the flexibility in operation modes of the adsorption process, such as the driving types of adsorption and the time spans of the processing steps. In particular, in developing the evaluation tool, the TSA model is simplified to curb the high computational cost originating from its longer operating time, higher dimension, and more variables such as the column wall temperature, compared to the PSA model. The proposed models can be used for predicting the $CO_2$ capture efficiency in order to optimize the adsorption process and suggest more appropriate operation modes for different adsorbents.