Design of a Pressure Swing Adsorption Process with Novel Carbon-based Adsorbents

가성빈, 이재형[1,*]
카이스트; [1]KAIST
(jayhlee@kaist.ac.kr*)

Recently, pressure swing adsorption (PSA) is considered as a strong substitutable candidate for conventional carbon capture technology due to its less energy requirement and no liquid solvent. However, PSA system has inherently periodic and discontinuous features, which allow no simple and easy way to estimate performance of the system with various adsorbents in industrial applications. In this work, we focus on the design of an optimal PSA system that can accept newly developed adsorbents based on carbon materials and evaluate its performance in advance. On the basis of a system involving a single bed separating flue gas into CO2 and N2, the objective of designing a PSA is to produce CO2 gas with the required concentration to be stored or utilized in subsequent processes with minimum operating cost. To perform the optimal design task, cubic spline collocation method (CSCM) is used for solving partial differential equations (PDEs) describing dynamics of PSA system. For the achievement of cyclic steady state (CSS) of the PSA system, successive substitution (SS) is employed. And then, optimization step is proceeded in order to find an optimal operating condition.