

163d Determination of Dynamic Mass Transfer Properties in O2 Rpsa

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In predicting the behavior of pressure swing adsorption systems, a fairly accurate estimation of the mass transfer properties of the adsorbent is required. Typically, either a lumped mass transfer parameter or structural parameters are used to model the mass transfer behavior. While these techniques have limitations, they have been adequate for predicting behavior in large systems with materials having relatively slower adsorption and desorption kinetics. In rapid cycle adsorption systems, such as those which may be used in small oxygen concentrators, an adsorbent having fast kinetics is essential in keeping the overall sieve inventory at a minimum. We have developed a technique to determine a “dynamic” mass transfer parameter by measuring the performance on a simple, small scale rapid VPSA system. The system is flexible to allow us to measure a parameter on a material across a given pressure envelope over a range of flow rates. We have shown that this technique can predict the behavior in rapid cycle adsorption systems more accurately than by using standard techniques. We have also incorporated the ability to observe the gas phase compositions during the cycle by spectroscopic means, thereby allowing us to determine the movement of the fronts and determine where the mass transfer limitations are during adsorption and desorption.