**Gas separations using continuous adsorption processes**

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The last 20 years has seen an explosion in the number of publications investigating porous solids for gas adsorption and separation. Including discovery of new materials such as metal–organic frameworks, covalent organic frameworks, synthetic zeolites, and non-porous adsorbents.

In this talk, we highlight the use of a *bound visualization* (Figure 1) that empirically correlates the trade-offs encountered when designing adsorbent materials for gas separation, specifically: capacity, selectivity, and heat of adsorption.1



**Figure 1.** The upper bound visualization for the trade-off between selectivity and capacity in materials for ethylene/ethane gas adsorption.

We apply bound visualizations to adsorbents studied for light alkene/alkane separations and a variety of other gas pairs (CO2, H2, CH4, N2, etc.). We highlight their use in identifying candidate materials for examination within process models, elucidating structural design principles for adsorbent materials, and the limitations of upper and lower bound visualizations.

1. Elashkar, A. H.; Hedley, G. S.; Qazvini, O. T.; Telfer, S. G.; Cowan, M. G., An upper bound visualization of design trade-offs in adsorbent materials for gas separations: alkene/alkane adsorbents. *Chemical Communications* **2021,** *57* (57), 6950-6959.