VAMAS

Solid Sorbents

Technical Work Area 39

Call for Participation

Project 4

Adsorption Capacity from Breakthrough Measurements on Zeolite 13X

Objectives

The objectives of this interlaboratory study are:

- To perform an interlaboratory comparison of CO_2:N_2 breakthrough measurements on zeolite 13X at 25 °C
- To extract consensus data for CO_2 and N_2 adsorption capacity for zeolite 13X for the various CO_2:N_2 mixtures from the breakthrough curves.
- To recommend measurement best practices for CO_2:N_2 breakthrough measurements.

Background

Adsorbents are candidate materials for many commercial and industrial applications, including carbon capture, directly from air or from point sources. Carbon capture often involves separating carbon dioxide from other gases and vapors, such as nitrogen and water vapor from air. Breakthrough measurements can provide information such as the selectivity of a material for one gas over another in a gas mixture. Reliable materials property data are needed to characterize, model, and evaluate materials to advance material development.

Standardization Needs

Currently, no CO_2:N_2 mixture adsorption reference standards (materials or data) exist from NIST or other organizations, especially for CO_2 at sorption ranges relevant to direct air capture or point source capture. The current study will analyze a Research-Grade Test Material (RGTM) for CO_2:N_2 breakthrough measurements to enable instrument validation, interlaboratory comparison of data, and ultimately accelerate the commercialization of materials for gas separation. Work done under this study could feed into the greater carbon standardization framework as well as complement ISO TC24/SC4 standardization efforts on solid sorbent materials.

Work Programme

The study will measure breakthrough curves for various mixtures of CO_2:N_2 on zeolite 13X at 25 ° C at ≈ ambient pressure and determine the adsorption capacity from each breakthrough curve. The adsorbent will be provided for the study along with study protocol. Each breakthrough measurement may take 1-2 days. A complete set of measurements for the study could take several weeks.

Deliverables and Dissemination

The resulting data will be made available on the NIST adsorption database and published in a peer-reviewed journal. The study will feed into reference material production and standardization work.

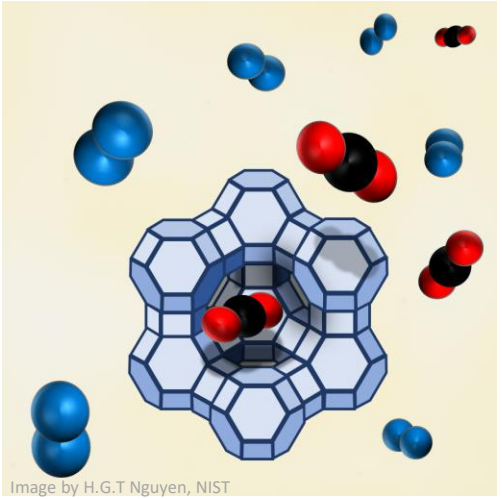

Figure 1: Cartoon representation of Zeolite 13X with N_2 and adsorbing CO_2 molecules.

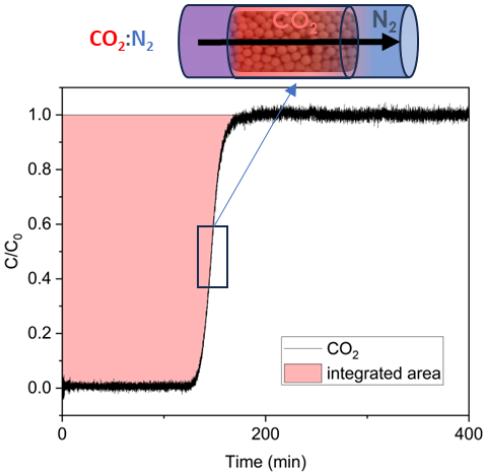

Figure 2: A representative breakthrough curve used to determine CO_2 adsorption capacity.

Funding

Participants fund their own involvement in the project.

Status

Samples are expected to be dispatched in late summer/early fall of 2026 to participants. Participants will be expected to report results by February 2027.

Disclaimer: VAMAS reserves the right to determine the extent of participant eligibility to comply with applicable national legal and export control requirements.

For more information:

Project Leader:
Huong Giang Nguyen
National Institute of Standards and Technology, USA
huong.nguyen@nist.gov

TWA 39 Chair
Huong Giang Nguyen
National Institute of Standards and Technology, USA
huong.nguyen@nist.gov

www.vamas.org

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