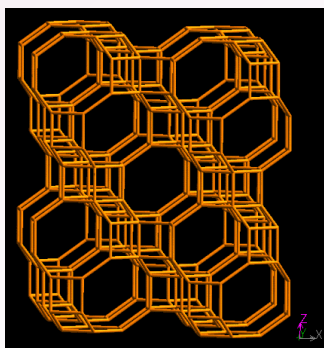


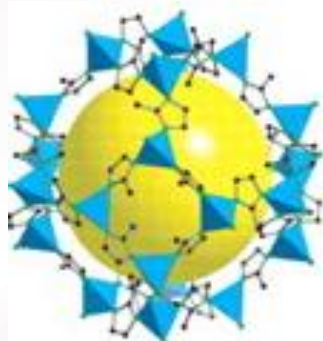
Rational Design of Zeolite Nanocrystals and Membranes at Different Length Scales for Carbon Dioxide Separation

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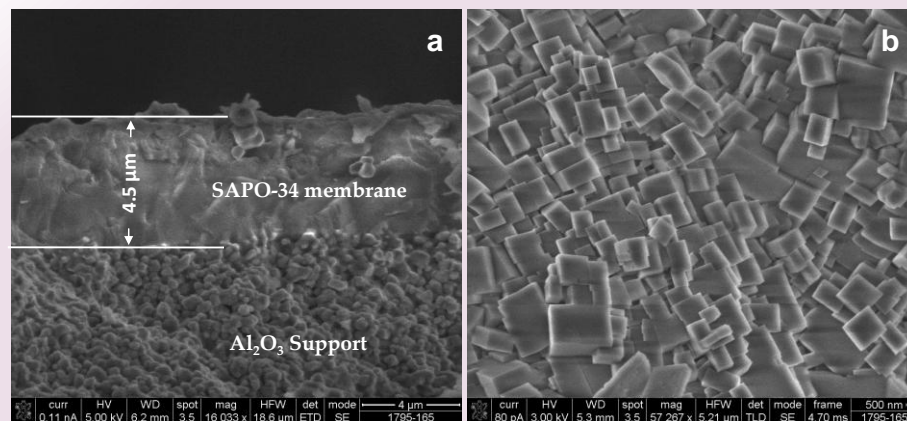
The proposed research focuses on the development of novel *self-assembly methods* for the molecular design of zeolite membranes displaying controlled crystal size at different length scales, controlled surface properties, and tunability of pore architectures for CO₂/CH₄ separation. Our results on SAPO-34 seeds demonstrate the benefits of one of the proposed self-assembly approaches in developing seeds displaying surface areas as high as 700 m²/g, small crystal sizes in the 0.5- 0.7 μm range with narrow size distribution and unprecedented high CO₂/CH₄ sorption capacities. The small crystal size, remarkable high CO₂/CH₄ sorption capacities of the synthesized SAPO-34 seeds translated into high CO₂/CH₄ separation selectivities while the > 5 μm thin membranes synthesized with these seeds led to CO₂ permeances as high as 1x10⁻⁶ mol/m² s Pa). The functionalization of the membranes with different amino groups has resulted in highly CO₂ selective membranes (CO₂/CH₄ selectivities > 250). In addition, we have recently developed novel metal organic framework membranes (ZIF-8) able to separate CO₂ from CH₄.



SAPO-34



ZIF-8



SAPO-34 membranes effectively separate CO₂/CH₄ mixtures

Continuous zeolite SAPO-34 and Metal organic framework ZIF-8 membranes have been synthesized in our lab.