

Fabrication of CO₂-Selective Si-DDR Zeolite Membranes: Effects of Particle Sizes on the Uniformity of Si-DDR Layers

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Among 8-MR zeolites, all silica DDR (Si-DDR) zeolites are suitable for separating CO₂ from N₂ or CH₄ through their molecular sieving property. If these materials are formed as membranes, they are highly expected to separate CO₂ from N₂ or CH₄ possibly in the presence of H₂O, primarily due to the hydrophobicity. For membrane fabrication, secondary growth method was adopted: a seed layer, comprised of zeolite particles or blocks, is first formed and its subsequent growth allows the formation of a continuous zeolite membrane. In this presentation, we will talk about a method of how to fabricate Si-DDR membranes. In particular, the effect of Si-DDR particles on the uniformity (the surface coverage and the preferential out-of-plane orientation) of the Si-DDR layer was investigated. This revealed a trade-off between the surface coverage and the orientation, indicating the optimal choice of layer-constituents. Additional hydrothermal growth led to a continuous Si-DDR film, though its performance indicated the need of elaborate work to find secondary growth conditions that allow forming less-defective Si-DDR membranes.