Probing the Role of Zr Addition versus Textural Properties in Enhancement of CO₂ Adsorption Performance in Silica/PEI Composite Sorbents

Scientific Achievement
An array of SBA-15/PEI composites with varying textural and morphological properties, as well as varying content of zirconium doped into the material, have been prepared and used to determine the efficacy of impregnated PEI in adsorbing CO₂ as a function of Zr doping.

Significance and Impact
Results show that the textural and morphological properties of the support have a more significant impact on the ability of PEI to capture CO₂ than the support surface composition.

Research Details
- incorporation of Zr by either synthetic or postsynthetic methods improved the amine efficiency of PEI when using an SBA-15 prepared by a “standard” synthesis method, which included hydrothermal aging at 100°C.
- When optimized SBA-15 silica was used as a support, no enhancement in CO₂ capacity was observed when Zr was incorporated by either method.
- Subtle textural properties play a more decisive role than acid/base properties of the silicate surface in controlling PEI/CO₂ interactions.