

A survey of potent adsorbents for separation of CO₂/N₂/CO/H₂ mixtures by pressure swing adsorption

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A variety of processes such as adsorption, absorption, membrane and other variants are commercially-available or developed to separate and purify a desired gas from mixed gas streams. The pressure swing adsorption (PSA) inherits certain advantages that are low energy requirements and cost-effectiveness, thereby being widely used for dilute gas mixtures purification, air fractionation, and hydrogen production from steam reformers and petroleum refinery offgases. Adsorbents are a key component consisting of PSA systems. Conventional materials including zeolites (X, Y), molecular sieves (4A, 5A), activated carbons, etc are commonly employed for such PSA applications, while metal organic frameworks (MOF) and zeolitic imidazolate frameworks (ZIF) are recently proposed as potent PSA adsorbents due to their high porosity and physical and chemical stabilities. To examine adsorbents suitable for selective separation of CO₂ and N₂ from a gas mixture containing CO₂/N₂/CO/H₂, we have reviewed a huge body of data of their adsorption on the conventional and new materials at chosen conditions and applicability of these adsorbents to the gas mixture has been discussed.