

420a Calcium Oxide Based Sorbents for Adsorption of CO₂ at High Temperatures

Hong Lu, Ettireddy P. Reddy, and Panagiotis (Peter) Smirniotis

Ca(NO₃)₂·4H₂O, CaO, Ca(OH)₂, CaCO₃, and Ca(CH₃COO)₂ ·H₂O were used as precursors for synthesis of calcium oxide sorbents of CO₂. Calcium acetate based sorbents resulted in the best adsorption performance of CO₂. In a wide operation window of 600-800°C, this sorbent has shown high adsorption of CO₂, 90% of which were achieved at the first 15 minutes of adsorption period. Calcium acetate based sorbents also showed great regenerability in multi adsorption-desorption cycles. After 25 cyclic adsorptions/desorption, the sorbent still had a conversion of 64% during adsorption of CO₂. High conversion and good regenerability of calcium acetate based sorbents are attributed to relatively large volume of mesopores and macropores produced during multi steps decomposition of synthesis. Sorbents from other precursors showed poorer performance since they had smaller pores, less pore volume and lower BET surface area. These high performance calcium oxide sorbents have great potential for numerous high temperature applications such as fuel cells, carbon sequestration, novel reactors, and coal gasification etc.