

REACTION KINETICS, CATALYSIS AND.....

采用CO<sub>2</sub>吸附剂强化的甲烷水蒸汽反应制氢气过程特点

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**摘要** The objective of the present study is to characterize the production of hydrogen with a sorptionenhanced steam-methane reaction process using Ca(OH)<sub>2</sub> as the CO<sub>2</sub> adsorbent. Theoretical equilibrium compositions at different operation conditions were calculated using an iterative method. It was found that with Ca(OH)<sub>2</sub> as the CO<sub>2</sub> sorbent, the concentration of CO<sub>2</sub> adsorption was reduced in the product stream, that gave rise to higher methane conversion and higher H<sub>2</sub> concentration. An experimental setup was built to test the theoretical calculation. The effects of sorbents and the particle size of Ca(OH)<sub>2</sub> on the concentration of CO<sub>2</sub> and H<sub>2</sub> were investigated in detail. Results showed that the reactor packed with catalyst and Ca(OH)<sub>2</sub> particles produced H<sub>2</sub> concentration of 94%. It was nearly 96% of the theoretical equilibrium limit, much higher than H<sub>2</sub> equilibrium concentration of 67.5% without CO<sub>2</sub> sorption under the same conditions of 500°C, 0.2 MPa pressure and a steam-to-methane ratio 6. In addition, the residual mole fraction of CO<sub>2</sub> was less than 0.001.

**关键词** 二氧化碳, 吸附剂, 氢气, 生产工艺, 水-甲烷气体, 吸附作用, 反应过程

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**The Characteristics of a Sorption-enhanced Steam-Methane Reaction for the Production of Hydrogen Using CO<sub>2</sub> Sorbent**

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**Key words** hydrogen, reactive-absorption, calcium hydroxide, steam-methane reforming.

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