

中低压条件下蛇纹石直接矿物碳酸化隔离CO₂的实验研究

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CO₂ sequestration by direct mineral carbonation of serpentine under medium and low pressure

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摘要 对中低压条件下蛇纹石CO₂直接矿物碳酸化隔离进行了一系列实验研究,考察了反应温度、反应压力、缓冲剂的加入、预先热处理、颗粒粒径及不同气氛等因素对蛇纹石矿物碳酸化吸收二氧化碳效率的影响。结果表明,在中低压条件下,蛇纹石可以通过液相直接矿物碳酸化对模拟烟气中的CO₂进行直接固定;随反应温度的升高、反应压力的增大,矿物碳酸化效率随之增加;对蛇纹石进行预先热处理或者在反应体系中引入NaHCO₃缓冲剂以及减小蛇纹石矿石颗粒粒径,可以有效地提高蛇纹石矿物碳酸化隔离二氧化碳的效率。在纯CO₂、*t*=150℃、*p*=4 MPa、颗粒粒径30 μm的条件下得到最高矿物碳酸化效率为47.7%;在模拟烟气、*t*=150℃、*p*=4 MPa、颗粒粒径30 μm的条件下最高矿物碳酸化效率也可以达到36.3%。

关键词: 中低压 二氧化碳 直接矿物碳酸化 蛇纹石 隔离

Abstract: Serpentine was used as the mineral material for CO₂ sequestration by direct mineral carbonation under medium and low pressure. A series number of experiments were carried out to investigate the factors that influence the conversion of carbonation reaction, such as temperature, pressure, particle size, solution composition and pretreatment. The results show that serpentine can be used to sequester CO₂ in simulated flue gas by aqueous direct mineral carbonation under medium and low pressure. Carbonation conversion increases with increasing temperature and pressure. Decrease in mineral particle sizes and use of heat treatment before carbonation can effectively improve the conversion. The addition of NaHCO₃, which has a buffering effect that kept the solution pH in a certain range, can also improve the carbonation conversion. The highest carbonation conversion of 47.7% and 36.3% was obtained in 60 min under 4 MPa and 150℃ for pure CO₂ gas and simulated flue gas, respectively.

Key words: medium and low pressure carbon dioxide direct mineral carbonation serpentine sequestration

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






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