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工程热物理

钙基吸收剂煅烧/加压碳酸化循环特性实验研究

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摘要： 石灰石的循环煅烧/碳酸化反应是燃煤电站分离CO2的有效方法。为解决石灰石在吸收CO2过程中随着循环反应次数增加碳酸化能力迅速衰减的问题，采用提高反应压力的方法提高其CO2捕获效率。研究表明，提高碳酸化反应压力有利于提高钙基吸收剂的碳酸化转化率。碳酸化反应压力一定时，钙基吸收剂在650~850℃下第一次转化率比较接近，随碳酸化温度的增加碳酸化转化率呈先增加后下降的趋势，碳酸化温度较高时碳酸化转化率随循环次数的增加下降较快，但仍比常压的最佳反应条件下的大。在700 ℃和0.5 MPa下钙基吸收剂获得最高的碳酸化转化率。碳酸化反应压力和温度一定时，增加碳酸化气氛中CO2浓度，碳酸化转化率并不一定提高，钙基吸收剂的加压碳酸化循环反应对不同的煅烧气氛具有非常好的适应性。

关键词： 钙基吸收剂 煅烧 加压碳酸化 CO2捕获

Study on Characteristics of Cyclic Calcination/Pressurized Carbonation of Ca-based Sorbents

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Abstract: The cyclic calcination/carbonation reaction of calcium-based sorbents is an effective approach for CO2 capture from coal combustion in power plants. In order to solve the problem of a sharp decay in carbonation conversion of limestone during the long-term calcination/carbonation cycles, carbonation pressure enhancement was proposed to improve its conversion. The results showed that carbonation conversion was improved by enhancing the carbonation pressure. Under a certain carbonation pressure, the calcined limestone achieved almost the same conversion at a carbonation temperature range from 650 to 850 ℃ for the first cycle. The conversion increased with increasing carbonation temperature firstly, and then decreased. However, it decreased rapidly with the cycle increasing at higher temperature, but it was still much greater than that at atmospheric condition. The highest conversion was achieved under the optimum condition of 700 ℃ and 0.5 MPa. Carbonation conversion did not always increase with increasing CO2 concentration at a certain carbonation temperature and pressure. Improved carbonation conversion could be reached with the calcined limestone under all atmospheres with a wide range of CO2 concentration.

Keywords: Ca-based sorbents calcination pressurized carbonation CO2 capture

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