

催化剂对CaO固硫反应活性的影响研究

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摘要 用热天平研究了在CaO中添加不同催化剂对固硫反应进程及固硫反应转化率的影响,并采用等效粒子模型处理实验数据,计算了固硫反应两个阶段(表面化学反应控制阶段及产物层扩散控制阶段)的动力学参数。实验表明不同的催化剂对CaO固硫的影响效果和机制不同:催化剂KNO₃, NaNO₃使表面化学反应活化能和产物层扩散控制阶段反应活化能降低,但同时使表面化学反应指前因子和扩散系数指前因子降低;而催化剂Fe₂O₃, V₂O₅增大了表面化学活化能和产物层扩散控制阶段反应活化能,但同时也增大了表面化学反应指前因子和扩散系数指前因子。并发现几种催化剂对活化能和指前因子的影响都具有耦合性,因此单以表面化学反应活化能或产物层扩散控制阶段反应活化能来判断固硫反应活性是不够全面的,应计算出具体温度下的反应速率常数和产物层扩散系数值,才能准确地反映固硫反应的活性。

关键词 [氧化钙](#) [固硫反应](#) [催化活性](#) [硝酸钾](#) [硝酸钠](#) [扩散系数](#)

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Effects of catalysts on the activity of CaO desulfurization

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Abstract Kinetics of CaO desulfurization reaction and the effects of some catalysts on the reaction were investigated by thermogravimetric analysis method. The results showed that the kinetic behavior of desulfurization could be modeled by a grain model. The activation energy of the surface reaction (E_a), the activation energy of the product layer diffusion (E_p), the rate constant (k), and the effective diffusivity (D_s) were determined using this model. The overall rates of desulfurization were controlled initially by the surface chemical reaction, and then shifted to product layer diffusion control. Some nitrates and oxides were chosen as catalysts and their catalytic effects on the kinetics of desulfurization were investigated. KNO₃, NaNO₃ could decrease the E_a , E_p , D_s , showing higher catalytic activity in low temperature region. Fe₂O₃, V₂O₅ could increase the E_a , E_p , D_s , with higher catalytic activity in high temperature region. All these salts or oxides could improve both the initial reaction rate and final fraction conversion of CaO at the favorable temperatures. It is noted that E_a and E_p can not be used separately to evaluate activities of catalysts because E_a , E_p , D_s are couple to each other. Nevertheless at certain temperatures k and D_s can be used to evaluate the effects of catalysts.

Key words [CALCIUM OXIDE](#) [CATALYTIC ACTIVITY](#) [POTASSIUM NITRATE](#) [SODIUM NITRATE](#) [DIFFUSION COEFFICIENTS](#)

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