

工程热物理

O₂/CO₂气氛下醋酸调质石灰石直接硫化实验研究

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摘要: 提出了采用醋酸溶液调质石灰石的方法来提高其直接硫化反应过程中的固硫能力。实验研究了醋酸浓度、温度、SO₂浓度等参数对醋酸调质前后2种石灰石在硫酸化过程中钙转化率的影响规律, 并采用氮吸附和X射线衍射(X-ray diffractometer, XRD)技术对石灰石及其硫化产物进行了分析。结果表明: 调质改善了石灰石的孔结构特性, 在直接硫化过程中比原始石灰石具有更高的钙转化率; 在所实验的温度范围内, 调质石灰石都可获得很高的钙转化率; 随SO₂浓度增大, 直接硫化反应速率升高, 调质石灰石钙转化率增大; 随醋酸浓度增大, 调质石灰石的钙转化率提高, 提高幅度因石灰石种类而异, 采用浓度为50%醋酸溶液作为调质剂可达到经济高效的目的; XRD图谱验证了醋酸调质石灰石直接硫化时钙转化率更高。

关键词: 醋酸调质 石灰石 直接硫化 钙转化率 X射线衍射

Experimental Investigation on Direct Sulphation Characteristics of Limestone Modified by Acetic Acid Solution Under O₂/CO₂ Atmosphere

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Abstract: Modification of limestone by acetic acid solution was proposed to improve the SO₂ capture capability of limestone during sulphation reaction process. The effects of several parameters, in terms of acetic acid concentration, temperature and SO₂ concentration, on calcium conversion of limestones and their modified products, calcium acetate (CA) were investigated during sulphation process. Nitrogen adsorption and X-ray diffractometer (XRD) analysis of the limestones and their sulphation products was conducted. The results show that the modified limestone shows higher surface area and pore volume, and its pore size distribution is better than that of raw limestone. The calcium conversion of CA in direct sulphation is much higher than that of raw limestone. CA reaches a high calcium conversion in wide temperature range tested, but the temperature has less substantial effect on the calcium conversion of CA. The reaction rate of direct sulphation increases with increasing SO₂ concentration in O₂/CO₂ atmosphere. The high concentration of acetic acid promotes direct sulphation rate, thus calcium conversion of CA, but different limestone has different effect. The limestone modified by 50% acetic acid solution not only has high calcium conversion, but also gets widespread applicability because of lower cost. The results of the XRD analysis also verify the superior calcium conversion of CA over that of raw limestone during direct sulphation process.

Keywords: acetic acid modification limestone direct sulphation calcium conversion X-ray diffractometer (XRD)

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1. 郑斌 路春美 姬丽霞 赵改菊. 废弃物型固硫剂的固硫性能研究[J]. 中国电机工程学报, 2009,29(11): 32-38
 2. 王乃光 阿娜尔 刘启旺 韩玉霞. 有机酸盐强化石灰石湿法烟气脱硫试验研究[J]. 中国电机工程学报, 2008,28(17): 61-65
 3. 刘豪 邱建荣 徐朝芬 成斌 谢长生. 煤灰氧化物与钙基固硫产物的高温多相反应机理[J]. 中国电机工程学报, 2007,27(32): 29-33
 4. 王春波 陈传敏. 碳酸钙直接硫化反应产物层固态离子扩散机理研究[J]. 中国电机工程学报, 2007,27(35): 44-48
 5. 张雷 田园 程世庆 路春美. 贝壳型脱硫剂内部气体扩散特性探讨[J]. 中国电机工程学报, 2008,28(11): 54-59
 6. 王芳 姚桂焕 归柯庭. 铁基催化剂选择性催化还原烟气脱硝特性比较研究[J]. 中国电机工程学报, 2009,29(29): 47-51
 7. 张保生 刘建忠 周俊虎 冯展管 岑可法. 粒度对石灰石分解动力学影响的热重实验研究[J]. 中国电机工程学报, 2010,30(2): 50-55
 8. 夏迎迎 付炜 王亦飞 于广锁 王辅臣. 高温煤气脱硫及其对逆水煤气变换反应的影响[J]. 中国电机工程学报, 2010,30(2): 56-61
 9. 尚建宇 王松岭 王春波 宋春常. 煅烧石灰石过程中团聚体颗粒内的晶粒融合现象分析[J]. 中国电机工程学报, 2010,30(14): 44-49
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