

论文

木醋调质石灰石固硫性能的动力学研究

刘洪涛, 韩奎华, 李辉, 刘梦琪, 路春美

山东大学 能源与动力工程学院, 山东 济南 250061

摘要:

采用木醋废液对石灰石进行调质改性, 利用热分析法研究了石灰石及木醋调质石灰石固硫反应过程, 并采用等效粒子模型对固硫反应过程进行了表征。研究结果表明, 在整个温度区间内(850~1000℃), 木醋调质均能显著提升石灰石的固硫性能。木醋调质石灰石的主要成分为水合醋酸钙, 其热解过程呈现多阶段性, 热解产物疏松多孔, 具有较大的比表面积, 这是调质后石灰石固硫性能发生显著提升的主因。动力学计算结果显示, 采用木醋调质石灰石对固硫反应的表面反应速率常数k影响不大, 但却能显著提高有效扩散系数Ds, 表明调质对固硫反应表面化学反应控制阶段的影响不明显, 一旦反应处于扩散控制阶段时, 调质对固硫反应的促进作用表现极为显著。

关键词: 木醋液; 调质; 固硫; 动力学; 有机钙

Kinetic study on desulfurization of limestone modified by wood vinegar

Abstract:

The sulfation reaction process and kinetics of limestone modified by wood vinegar, a kind of waste liquid, were analyzed by thermogravimetric analysis method and grain reaction model. The results show that the desulfurization performance of limestone can be effectively improved after being modified by wood vinegar in the whole temperature range (850-1 000 °C). The phase composition analysis measured by XRD of limestone modified by wood vinegar shows that the major composition in the sample is hydration calcium acetate. The thermal decomposition of modified limestone shows the characteristic of multi-stage. The structure of thermal decomposition product of modified limestone, measured by scanning electron microscope and nitrogen adsorption method, is much looser than that of original limestone, which is conducive to the sulfation reaction. The rate constant of the surface reaction (k) of modified limestone is slightly smaller than original limestone's, but there is huge gap between the effective diffusivity of reactant in the product layer (Ds) of these two samples. The enhancement of sulfation is more pronounced once the product layer has been formed and consequently the promoting effect becomes greater once the sulfation reaction becomes diffusion controlled.

Keywords: wood vinegar; modify; desulfurization; kinetic; organic calcium

收稿日期 2011-10-13 修回日期 2011-12-09 网络版发布日期 2012-12-11

DOI:

基金项目:

山东省自然科学基金资助项目(ZR2009FQ016); 山东大学自主创新基金资助项目(2010TS020); 山东大学研究生自主创新基金资助项目(yzc11058)

通讯作者: 刘洪涛

作者简介: 刘洪涛(1985—), 男, 山东文登人, 博士研究生

作者Email: lhtlemon@qq.com

参考文献:

本刊中的类似文章

扩展功能

本文信息

- ▶ Supporting info
- ▶ PDF(1379KB)
- ▶ [HTML全文]
- ▶ 参考文献PDF
- ▶ 参考文献

服务与反馈

- ▶ 把本文推荐给朋友
- ▶ 加入我的书架
- ▶ 加入引用管理器
- ▶ 引用本文
- ▶ Email Alert
- ▶ 文章反馈
- ▶ 浏览反馈信息

本文关键词相关文章

- ▶ 木醋液; 调质; 固硫; 动力学; 有机钙

本文作者相关文章

- ▶ 刘洪涛
- ▶ 韩奎华
- ▶ 路春美
- ▶ 李辉
- ▶ 刘梦琪

PubMed

- ▶ Article by Liu,H.S
- ▶ Article by Han,K.H
- ▶ Article by Luo,C.M
- ▶ Article by Li,h
- ▶ Article by Liu,M.Q