

论文

氢对氧化铁脱硫剂脱硫行为的影响

刘生昕, 樊惠玲, 孙婷, 陈兆辉, 上官炬, 梁丽彤

太原理工大学 煤科学与技术省部共建国家重点实验室培育基地, 山西 太原 030024

摘要:

以钢厂赤泥为活性组分, 以聚苯乙烯(Polystyrene)微球为造孔剂, 加入一定量黏土作黏合剂, 经干混法制备氧化铁脱硫剂。采用压汞法、氮吸附、XRD对脱硫剂进行表征; 采用热重法考察了氢以及预还原对脱硫剂性能的影响。结果表明: 有氢与无氢气氛下氧化铁脱除H<sub>2</sub>S的行为不同, 有氢气氛下氧化铁脱除H<sub>2</sub>S的速率小于无氢气氛下的脱硫速率, 引起这种差异的原因是两种气氛下氧化铁脱硫的机理不同; 脱硫剂在经H<sub>2</sub>深度预还原后, 呈现出低价态, 低价铁的本征硫化速率虽然高于氧化铁, 但由于过度还原会引起脱硫剂的结构塌陷, 反而会抑制脱硫反应的进行。

关键词: 氧化铁脱硫剂; 脱硫; 氢

The effects of hydrogen on the desulfurization behavior of iron oxide sorbents

Abstract:

Iron oxide sorbent was prepared with the dry-mixing method using red-mud from steel factory as the activating component, the synthesized polystyrene (PS) microspheres as pore-forming material and clay as binder. The sorbent was characterized by nitrogen adsorption, mercury porosimetry, and XRD. Thermogravimetric analysis was used to investigate the effects of hydrogen, as well as pre-reduction, on the behavior of the sorbent for H<sub>2</sub>S removal. The results show that iron oxide sorbent exhibits different behaviors in the atmosphere with or without hydrogen. H<sub>2</sub>S removal from the hydrogen-containing gas mixture is slower than from mixtures without hydrogen, which is due to the different mechanism of the reaction in different atmospheres. Iron oxide is converted to the state of low oxidation after being reduced by hydrogen. Iron with low oxidation state may react with H<sub>2</sub>S quickly in intrinsic kinetics. However, the sulfidation is unexpectedly inhibited owing to the destruction of the sorbent structure caused by deep reduction.

Keywords: iron oxide sorbent; desulfurization; hydrogen

收稿日期 2011-12-12 修回日期 2012-04-10 网络版发布日期 2013-02-21

DOI:

基金项目:

国家自然科学基金资助项目(20976114); 山西自然科学基金资助项目(2011011008-2); 山西省回国留学人员科研资助基金资助项目(2011-040)

通讯作者: 刘生昕

作者简介: 刘生昕(1984—), 男, 陕西榆林人, 硕士研究生

作者Email: lsxtylg@163.com

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