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能源和环境工程

沛城煤矿天然焦的热解特性

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摘要 天然焦是一种热值在18～28 MJ·kg-1 的化石燃料，虽储量丰富，但多被弃用，有待于开发利用。采用TG-FT-IR联用技术在Thermax500 型加压热重分析仪上比较徐州沛城煤矿天然焦与徐州韩桥烟煤的热解过程，并利用VECTOR 22 型红外分析仪对热解产物进行了分析。考察了升温速率、热解终温、颗粒尺寸和压力对天然焦热解特性的影响。结果表明，与煤的热解过程不同，天然焦的热解没有半焦形成阶段，只包括了2 个不同的脱气阶段；随升温速率的提高，TG曲线向高温区偏移，升温速率对天然焦挥发分的析出量几乎没有影响；热解终温对试样挥发分析出量的影响较为明显，高温时，试样颗粒在显微镜下呈现出丰富的微孔结构，有利于挥发分的析出和还原活性的提高；颗粒粒度的减小有利于挥发分的析出；低于某特定温度，热解压力的影响较弱，当温度继续升高，压力的影响逐渐明显。

关键词 天然焦；热解；热重法；红外；扫描电镜

分类号

Pyrolysis characteristics of Peicheng natural coke

Abstract

Natural coke is a kind of fossil fuel with heating value of about 18—28 MJ·kg-1. There are abundant natural coke reserves in the world, but at present it is abandoned and research and development are needed for its utilization. Thermogravimetric analysis(TG) and Fourier-transform infrared(FT-IR) coupled technology was used to investigate the pyrolysis characteristics of natural coke (Peicheng mine, Xuzhou, Jiangsu Province, China) and bituminous coal (Hanqiao mine, Xuzhou, Jiangsu Province, China) in this paper. The pyrolysis products were analyzed with the VECTOR 22 infrared analyzer. The effects of heating rate, final pyrolysis temperature, particle diameter, and operating pressure on the pyrolysis process of natural coke were examined with the Thermax 500 pressurized thermogravimetry. The results showed that different from the pyrolysis of coal, including three stages—drying, semi-char forming and degasification,the pyrolysis process of natural coke could be divided into two different stages of degasification. With the increase of heating rate, the TG curve shifted to the high temperature area. The heating rate had almost no effect on the ultimate release of volatile matter. Final pyrolysis temperature had a strong impact on the ultimate release of volatile matter. The higher the final pyrolysis temperature, the more the ultimate release of volatile matter. SEM pictures showed that natural coke pyrolyzed at a higher temperature had a better porous structure, which was beneficial to the release of volatile matter and had a better reduction activity. Decrease in particle size led to more release of volatile matter. Pressure has less effect on pyrolysis at a lower temperature, while its effect became stronger when the temperature was higher than a given value.

Key words natural coke；pyrolysis；thermogravimetry；infrared；SEM

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