

工程热物理

激光诱导击穿光谱测量未燃碳的煤种适应性分析

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摘要: 将激光诱导击穿光谱技术(laser-induced breakdown spectroscopy, LIBS)应用于粉煤灰未燃碳的分析。通过快速灰化法制取不同含碳量的粉煤灰样品。利用脉冲激光在大气常压环境下激发样品, 探测等离子体发射信号, 得到未燃碳的光谱信息。由一种煤样制得的6组灰样构建未燃碳定标曲线, 分析另外2种不同煤种的灰样未燃碳含量, 以验证激光诱导击穿光谱技术分析粉煤灰未燃碳的煤种适应性能力。研究表明, 通过采用适当的数据处理方法, 由一种煤样制取的粉煤灰建立定标曲线, 可分析不同煤种的粉煤灰样品, 并能得到良好的定量分析结果。分析信号重复测量值的相对标准偏差小于8.08%, 未燃碳定量分析的相对误差小于2.27%。证明了激光诱导击穿光谱技术适用于粉煤灰未燃碳的快速测量, 并具有良好的煤种适应性能力。

关键词: 激光诱导击穿光谱 粉煤灰未燃碳 煤种适应性 定量分析

Coal Suitability of the Measurement of Unburned Carbon by Laser-induced Breakdown Spectroscopy

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Abstract: Laser-induced breakdown spectroscopy was used to analyze unburned carbon in fly ash. The samples were gotten using fast ashing method and excited by pulse laser and plasma was formed at atmospheric pressure. The emitted signal which contains the information of unburned carbon in fly ash was detected. The calibration curve constructed base on six samples of one kind of coal ash, and two samples of other two kinds of coal ash were analyzed. The experimental results show that calibration curve constructed with the data from same kind of coal ash can be used to analyze the different kinds of fly ash using proper data processing method. The relative standard deviation of repetition of measured values are less than 8.08%, the relative errors are less than 2.27%. It is indicated that laser-induced breakdown spectroscopy is suitable for rapidly detect unburned carbon in fly ash with receptible applicability.

Keywords: laser-induced breakdown spectroscopy unburned carbon of fly ash coal suitability quantitative analysis

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