

## 论文

### 不同收光方式下煤粉流的等离子体信号探测

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#### 摘要:

针对煤粉流组分分布的不均匀性, 研究不同收光方式对煤粉流的激光诱导等离子体的光谱信号收集效果的影响. 选用电厂常用燃煤神木混为实验对象, 利用自行搭建的气固两相流实验台架产生稳定煤粉流, 对比同向收光方式和侧向收光方式下煤的特征谱线信号探测的强度和稳定性. 研究结果表明, 相同实验条件下, 中间穿孔反射镜使同向收光方式下探测的光谱信号强度较弱, 而等离子体信号源位置沿激光束轴线的变化、等离子体信号本身沿空间分布的不均匀性及煤粉流的阻挡作用使侧向收光方式下探测的光谱信号稳定性较弱.

关键词: 光谱学 激光诱导击穿光谱 收光方式 煤粉流

### Investigation on Collection Performances of Plasma Signal for Pulverized Particle Coal Flow in Different Optical Collection

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#### Abstract:

In order to reduce the adverse impact of the inhomogeneous of pulverized coal components, different optical path systems were set up and used to research the collection performances of plasma of pulverized coal by laser-induced breakdown spectroscopy. The coal samples, Shenmuhun, was chosen for experiment. The detected count and stability of special lines of coal in different optical collection were investigated on the self-built two-phase particle flow experiment bench, which was used to produce stable pulverized coal stream. The analysis results show that in the steadily repeat measurements, the counts of the lines collected by back-side are weaker because of the intermediate perforated mirror, while the stability of the lines collected by side are worse because of the position change of plasma along the laser beam, the spatial inhomogeneity of plasma and the blocking effect of pulverized coal.

Keywords: Spectroscopy Laser-induced breakdown spectroscopy Optical collection Pulverized coal stream

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参考文献:

[1] CTVRTNICKOVA T, CABALIN L, LASERNA J, et al. Laser ablation of powdered samples and analysis by means of laser-induced breakdown spectroscopy

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[J]. Applied Surface Science, 2009, 255(10): 5329-5333. 

[2] CANEVE L, COLAO F, FANTONI R, et al. Laser ablation of copper based alloys by single and double pulse laser induced breakdown spectroscopy

[J]. Applied Physics A, 2006, 85(2): 151-157. 

[3] WOLFGANG S, JURGEN B, KAY N. Basic investigations for laser microanalysis: IV. The dependence on the laser wavelength in laser ablation

[J]. Mikrochim Acta, 1992, 108(1-2): 1-10. 

[4] MICHEAL T, QING S, BENJAMIN S, et al. Direct determination of trace elements in terephthalic acid by laser induced breakdown spectroscopy

[J]. Analytica Chimica Acta, 2000, 419(2): 153-158. 

[5] AGUILERA J A, ARAGON C, PENALBA F. Plasma shielding effect in laser ablation of metallic samples and its influence on LIBS analysis


[J]. Applied Surface Science, 1998, 127-129: 309-314.

[6] CREMERS D A, RADZIEMSKI L J. Handbook of laser-induced breakdown spectroscopy

[M]. John Wiley and Sons, New York, 2006.

[7] LI Ping, LU Ji-dong, XIE Cheng-li, et al. Influence of moisture on plasma characters of laser-induced pulverized coal

[J]. Chinese Journal of Lasers, 2009, 36(4):828-832. 李娉,陆继东,谢承利,等.水分对激光诱导煤粉等离子体特性的影响

[J]. 中国激光,2009,36(4):828-832. 

[8] MOHAMED W T Y. Improved LIBS limit of detection of Be, Mg, Si, Mn, Fe and Cu in aluminum alloy samples using a portable Echelle spectrometer with ICCD camera

[J]. Optics & Laser Technology, 2008, 40(1): 30-38. 

[9] GRANT K J, PAUL G L, O'NEILL J A. Quantitative elemental analysis of iron ore by laser-induced breakdown spectroscopy

[J]. Applied Spectroscopy, 1991, 45(4): 701-705. 

[10] DONG Mei-rong, LU Ji-dong, YAO Shun-chun, et al. Quantitative analysis of carbon content in coal with multivariate calibration by LIBS

[J]. Journal of Engineering Thermophysics, 2012, 33(1): 175-179. 董美蓉,陆继东,姚顺春,等.基于多元定标法的煤粉碳元素LIBS定量分析

[J]. 工程热物理学报,2012,33(1): 175-179.

[11] YAO Shun-chun, LU Ji-dong, LU Zhi-min, et al. Influence of sample morphology on laser ablation properties of coal

[J]. Acta Optica Sinica. 2009, 29(4): 1126-1130. 姚顺春,陆继东,卢志民,等.样品形态对燃煤的激光烧蚀特性影响分析

[J]. 光学学报,2009,29(4):1126-1130.

[12] XIE Cheng-li, LU Ji-dong, LI Peng-yan, et al. Quantitative analysis of ash component in coal by laser induced breakdown spectroscopy

[J]. Journal of Engineering Thermophysics, 2009, 30(2): 329-332. 谢承利,陆继东,李鹏艳,等.激光诱导击穿光谱法分析燃煤的灰成分

[J]. 工程热物理学报, 2009,30(2): 329-332.

[13] XIE Cheng-li, LU Ji-dong, LI Jie, et al. Study on real-time evaluation of slagging propensities of coals based on laser-induced breakdown spectroscopy

[J]. Proceedings of the CSEE, 2007,27(23):24-27. 谢承利, 陆继东, 李捷, 等. 基于激光感生击穿光谱的燃煤结渣特性评估

[J]. 中国电机工程学报,2007,27(23):24-27.

[14] YAO Shun-chun, LU Ji-dong, PAN Sheng-hua, et al. Analysis of unburned carbon in coal fly ash by using laser-induced breakdown spectroscopy in deep UV

[J]. Chinese Journal of Lasers, 2010, 37(4): 1114-1117. 姚顺春,陆继东,潘圣华,等.粉煤灰未燃碳的深紫外激光诱导击穿光谱分析

[15] NIST Atomic Spectra Database.

[DB]

[2010-3-25]; <http://www.nist.gov/physlab/index.cfm>.

本刊中的类似文章

1. 张纪梅 许世超 宋秀云 代昭 孙波 姚翠翠. CdTe, 核壳型CdTe/CdS及CdTe/ZnS量子点的合成及表征[J]. 光子学报, 2009, 38(4): 905-910
2. 罗志徽; 贺俊芳; 汪敏强; 张苏娟; 彭延湘.

ZnSe/SiO<sub>2</sub> 半导体量子点玻璃的光谱特性

[J]. 光子学报, 2007, 36(3): 471-475

3. 蔡霞 王水才 贺俊芳 彭菊芳 刘晓 匡廷云. 83 K光系统II核心复合物不同激发的荧光光谱学[J]. 光子学报, 2007, 36(6): 1128-1132
4. 方琰. 激光显微荧光光谱精密测量光量子特性的方法[J]. 光子学报, 2010, 39(sup1): 6-8
5. 李田泽; 魏佩瑜. 调节转移技术在激光二极管频率稳定中的研究[J]. 光子学报, 2004, 33(7): 800-802
6. 王洪建|肖沙里|施军|黄显宾|杨礼兵|蔡红春|周少彤|张思群|姜蓉蓉. 喷气箍缩等离子体X射线椭圆弯晶谱仪研究 [J]. 光子学报, 2009, 38(5): 1212-1215
7. 刘志明 胡碧茹 吴文健 张勇. 高光谱探测绿色涂料伪装的光谱成像研究 [J]. 光子学报, 2009, 38(4): 885-890
8. 贾辉; 姚勇. 编码模板误差引起测量光谱图像改变的分析[J]. 光子学报, 2007, 36(2): 294-299
9. 张雷 殷春浩 黄志敏 焦杨. Cr<sup>3+</sup>: MgAl<sub>2</sub>O<sub>4</sub>晶体的基态能级分裂及Jahn-Teller效应\*[J]. 光子学报, 2007, 36(10): 1893-1898
10. 徐正红 张镇西 王晶 张虹. 电压敏感染料di-4-ANEPPS在灌注液中的光谱特性[J]. 光子学报, 2008, 37(3): 552-554
11. 李晓娟 于晓波 赵昕 李长敏 林海. Eu(TTFA)<sub>3</sub>掺杂环氧基光刻胶薄膜的强烈红色荧光 [J]. 光子学报, 2009, 38(9): 2343-2347
12. 李剑 倪亚茹 陆春华 薛君凯 许仲梓. Sm<sup>1+</sup> xMx(TTA)<sub>3</sub>phen转光剂的合成及荧光性能 [J]. 光子学报, 2009, 38(9): 2348-2352
13. 李鹏, 赵志敏, 洪小芹. 基于光谱分析方法的光引发剂量子效率评估 [J]. 光子学报, 2009, 38(11): 2816-2819
14. 刘智超, 张记龙, 王志斌, 李晓, 田二明, 阎鹤. 静态傅里叶变换干涉具在大视场探测中的应用 [J]. 光子学报, 2009, 38(11): 2839-2843
15. 沈沁梅, 周卫东, 李科学. 激光诱导击穿光谱结合神经网络测定土壤中的Cr和Ba [J]. 光子学报, 2010, 39(12): 2134-2138

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