

# 分析仪器本科实验教学仪器的设计及应用-以激光诱导击穿光谱 元素成像仪器为例

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**摘要:** 激光诱导击穿光谱技术 (Laser-induced breakdown spectroscopy, LIBS) 在元素原位快速分析时拥有突出的技术优势, 尤其是具备无需复杂样品前处理、可对样品直接分析的突出特点, 目前元素扫描成像是 LIBS 技术的重要研究及应用方向之一。设计并搭建了基于纳秒脉冲激光器的元素成像 LIBS 装置, 并实现了仪器化研发, 仪器光斑分辨率 50-100  $\mu\text{m}$ , 可实现自动化扫描, 满足实际分析需求, 目标元素光谱经基线扣除, 峰面积拟合及归一化处理后绘制分布热图, 并以伪彩呈现样品不同区域的元素分布。立足该新型仪器装置开发了系列应用, 初步设置了隐写墨水成像、生物组织元素成像及植物元素分布三个教学应用环节。后续将致力于相关教学实验环节的拓展, 为仪器科学与技术领域的实验教学提供一种新的自主研发型设备。

**关键词:** 激光诱导击穿光谱; 元素成像; 实验教学仪器; 分析仪器

## Design and Application of Analytical Instruments: A Case of Laser-Induced Breakdown Spectroscopy for Element Imaging Instrument

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**Abstract:** Laser-induced breakdown spectroscopy (LIBS) has outstanding technical advantages for the rapid in situ analysis of elements, especially for the direct analysis of solid samples without complex sample pre-treatment, and elemental scanning imaging is currently an important research and application direction of LIBS technology. A nanosecond pulsed laser-based elemental imaging LIBS device was developed with a spot resolution of 50-100  $\mu\text{m}$ . The spectra of the target elements were normalized by baseline deduction, peak area fitting and normalization to produce a distribution thermogram with a pseudo-color representation of the elemental distribution in different regions of the sample. Based on this new instrument, a series of applications have been developed. Three teaching and application have been preliminarily developed: steganography ink imaging, biological

tissue element imaging and plant element distribution. In the future, we will further devote to the expansion of related teaching experiments and provide a new equipment for experimental teaching in the field of instrument science and technology.

**Keywords:**Laser-induced breakdown spectroscopy; Element imaging; Teaching instrument; Analytical instruments

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