# Accepted Manuscript


Sensitive elemental detection using microwave-assisted laser-induced breakdown imaging

Adeel Iqbal, Zhiwei Sun, Matthew Wall, Zeyad Alwahabi

PII: S0584-8547(17)30098-8
DOI: doi: 10.1016/j.sab.2017.07.008
Reference: SAB 5281

To appear in: *Spectrochimica Acta Part B: Atomic Spectroscopy*

Received date: 21 February 2017
Revised date: 22 June 2017
Accepted date: 30 July 2017

Please cite this article as: Adeel Iqbal, Zhiwei Sun, Matthew Wall, Zeyad Alwahabi , Sensitive elemental detection using microwave-assisted laser-induced breakdown imaging, *Spectrochimica Acta Part B: Atomic Spectroscopy* (2017), doi: 10.1016/j.sab.2017.07.008

# Sensitive elemental detection using microwave-assisted laser-induced breakdown imaging

**Adeel Iqbal[1], Zhiwei Sun[2], Matthew Wall[1], and Zeyad Alwahabi[1, *]**

*[1]School of Chemical Engineering, The University of Adelaide, S.A. 5005, Australia*

*[2]School of Mechanical Engineering, The University of Adelaide, S.A. 5005, Australia*

**Corresponding author: zeyad.alwahabi@adelaide.edu.au*

**Abstract**

This study reports a sensitive spectroscopic method for quantitative elemental detection by manipulating the temporal and spatial parameters of laser-induced plasma. The method was tested for indium detection in solid samples, in which laser ablation was used to generate a tiny plasma. The lifetime of the laser-induced plasma can be extended to hundreds of microseconds using microwave injection to remobilize the electrons. In this novel method, temporal integrated signal of indium emission was significantly enhanced. Meanwhile, the projected detectable area of the excited indium atoms was also significantly improved using an interference-, instead of diffraction-, based technique, achieved by directly imaging microwave-enhanced plasma through a novel narrow-bandpass filter, exactly centered at the indium emission line. Quantitative laser-induce breakdown spectroscopy was also recorded simultaneously with the new imaging method. The intensities recorded form both methods exhibit very good mutual linear relationship. The detection intensity was improved to 14-folds because of the combined improvements in the plasma lifetime and the area of detection.

**Keywords**: *Laser-induced breakdown spectroscopy (LIBS), signal enhancement, microwave assisted, imaging;*