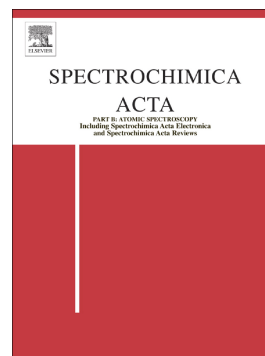


## Accepted Manuscript

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PII: S0584-8547(18)30306-9  
DOI: [doi:10.1016/j.sab.2018.09.010](https://doi.org/10.1016/j.sab.2018.09.010)  
Reference: SAB 5530

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

Received date: 5 July 2018  
Revised date: 25 September 2018  
Accepted date: 26 September 2018

Please cite this article as: Jinesh Jain, C. Derrick Quarles, Johnathan Moore, Daniel A. Hartzler, Dustin McIntyre, Dustin Crandall, Elemental mapping and geochemical characterization of gas producing shales by laser induced breakdown spectroscopy. *Sab* (2018), doi:[10.1016/j.sab.2018.09.010](https://doi.org/10.1016/j.sab.2018.09.010)

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## Elemental Mapping and Geochemical Characterization of Gas Producing Shales by Laser Induced Breakdown Spectroscopy

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### Abstract

Laser induced breakdown spectroscopy (LIBS) has been used for the analysis of hydrocarbon bearing shale samples. Shale samples taken from a Marcellus gas well at depths ranging from 7498-7551 feet (2285.4 – 2301.5 m) were analyzed by LIBS using an 81 x 81 grid pattern covering an 8 x 8 mm area. The data collected from these experiments were used to construct 2D elemental maps for each sample including the hydrocarbon forming elements C and H. Results show that the spatial elemental composition of the shale varies due to the matrix of the rock, and as a function of the sample depth. The accuracy of analysis was confirmed by analyzing a shale sample of known elemental concentrations and obtaining a good agreement between analyzed and reference values. It has been shown that LIBS can be used to determine elemental composition variations in hydrocarbon bearing shales in a laboratory setting. Extending this capability into wellbores will enable producers to rapidly target resources with greater accuracy.

**Keywords:** Laser Induced Breakdown Spectroscopy, Elemental Analysis, Hydrocarbon, Marcellus Shale

### Introduction

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