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Chapter 13

How Chemometrics Allowed the Development of LIBS in the Quantification and Detection of Isotopes: A Case Study of Uranium

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Book Editor(s):Vivek K. Singh, Durgesh Kumar Tripathi, Yoshihiro Deguchi, Zhenzhen Wang

First published: 17 March 2023 **https://doi.org/10.1002/9781119758396.ch13**

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Laser Induced Breakdown Spectroscopy (LIBS): Concepts, Instrumentation, Data Analysis and Applications

References Related Information

Summary

Detection of special nuclear materials, such as uranium and thorium, with regard to nuclear safeguarding, is one of the main objectives of the International Atomic Energy Agency. This chapter shows how it is possible to use chemometric methods in laser-induced breakdown spectroscopy for the quantification and detection of uranium isotopes. It briefly describes the experimental method for acquiring spectra information. In order to perform the calibration with the spectra obtained and determine the ratio of uranium isotopes in the samples, the authors decided to use the Orange program. This platform allows a complete analysis of the spectra using the different chemometric algorithms such as principal component analysis and partial least squares. The chapter also presents the chemometric methods used to show how it is possible to quantify the uranium 235/238 ratio in low-resolution spectra.

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