Elemental analysis of zircons via tandem Femtosecond Laser Ablation ICP-MS and Laser Induced Breakdown Spectroscopy (LIBS)

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Zircon is a common accessory mineral found in several types of igneous, metamorphic, and sedimentary rocks [1]. It is used in various geochemical studies, such as in U-Pb geochronology, where it is the most commonly used mineral due to its ability to withstand weathering and low degree metamorphism because of its stable crystal lattice, and because its lattice is compatible with U and not with Pb, leading to minimal common Pb in zircon [e.g., 2].

Laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS) has proved to be an efficient technique for analyzing various trace elements [3, 4]; however it fails to detect major and minor elements such as H and O, and has difficulties detecting other elements such as N, F, Cl, etc., all which are detectable via Laser Induced Breakdown Spectroscopy (LIBS). Through the simultaneous use of LA-ICP-MS and LIBS [e.g., 5, 6] the user can accurately analyze any element on the periodic table.

In this study, we have analyzed zircons via the traditional LA-ICP-MS approach in tandem with LIBS using a femtosecond laser system equipped with dual intensified charge-coupled devices. The results determined that LIBS is a valuable addition to the traditional LA-ICP-MS method for elemental analyses.

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