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LASER-INDUCED BREAKDOWN SPECTROSCOPY (LIBS) FOR COINS ANALYSIS

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Laser-induced breakdown spectroscopy (LIBS) is a powerful and rapid optical emission spectroscopy used for the elemental analysis of a wide variety of materials. In contrast to spectroscopic methods dependent on X-rays (e.g. XRF), LIBS offers the ability for trace analysis even for light elements. The emission from microplasma created by a focused 30 fs pulse laser beam at λ=800nm, is collected and analyzed. The identification of the recorded spectral features allows the determination of the elemental composition and structural formation of the irradiated samples. Eleven coins, originating from different countries and spanning a chronological range of over one hundred years, were studied. The primary objective of the study is to demonstrate the effectiveness of LIBS as a tool for rapid qualitative elemental analysis in cultural heritage studies.
The analysis revealed that most of the coins contained copper (Cu) as the predominant element, which is consistent with common coining practices. In addition to copper, minor elements such as iron (Fe), nickel (Ni) and manganese (Mn), were detected in several samples. Trace levels of other elements, including zinc (Zn), lead (Pb), aluminum (Al) and calcium (Ca), were also observed in some coins, suggesting either intentional alloying or contamination during manufacturing. The subsequent consequences of laser ablation on the coin surfaces were also explored. For three selected coins, the diameter of the created craters was measured, providing information on the surface response.

KEYWORDS:Laser-induced breakdown spectroscopy (LIBS), coins, structural analysis, ablation

Primary authors: Prof. MICO, Silvana (Department of Physics, University of Tirana); Mrs HIDRI, Sara (Institute of Applied Nuclear Physics, University of Tirana, Albania); Ms SARAFIS, Alexandros (Department of Physics, University of Ioannina); Dr KECHAOGLOU, Emmanouil (Department of Physics, University of Ioannina); Prof. KOSMIDIS, Constantine (Department of Physics, University of Ioannina)

Presenter: Prof. MICO, Silvana (Department of Physics, University of Tirana)

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