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Elemental analysis of dental amalgams by Laser-induced Breakdown Spectroscopy technique

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Abstract

Mercury is a chemical element used in multiple applications; it is non-degradable and has bioaccumulation potential. Among toxic metals, mercury gets attention for its high toxic capacity. There is, therefore, great interest in developing analytical techniques for detection and real-time monitoring of mercury, to obtain reliable data for fundamental and applied studies, aimed to a rational and responsible use of this material, and to minimize its impact on the environment. In this work, the Laser-Induced Breakdown Spectroscopy (LIBS) technique is applied to the analysis of dental amalgams with varying mercury concentrations in an Ag-Cu-Sn matrix. For each multi-elemental sample, we observed and recorded the spectra of laser-plasmas at delay times after the laser pulse between 1 and 5 μ s. Calibration curves were built to determine the concentration of mercury in the amalgams, using suitable corrections to compensate for the changes in electron number density and temperature associated to the large changes in the samples' matrix occurring at the different Hg concentration. The accuracy of the calibration curves at different delay times was estimated and discussed.

Keywords: LIBS; Mercury; Dental amalgam; Calibration curves

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