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Portable hybrid laser induced breakdown spectroscopy-diffuse reflectance spectrometer for spectroscopic analysis of inorganic pigments

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Abstract

A novel, portable spectrometer, combining two analytical techniques, laser-induced breakdown spectroscopy (LIBS) and diffuse reflectance spectroscopy, was developed with the aim to provide an enhanced instrumental and methodological approach with regard to the analysis of pigments in objects of cultural heritage. Technical details about the hybrid spectrometer and its operation are presented and examples are given relevant to the analysis of paint materials. Both LIBS and diffuse reflectance spectra of several samples of neat mineral pigments were recorded and the complementary information was used to effectively distinguish different types of pigments even if they had similar colour or elemental composition. The spectrometer was also employed in the analysis of different paints on the surface of an ancient pottery sherd demonstrating the capabilities of the proposed hybrid diagnostic approach. Despite its instrumental simplicity and compact size, the spectrometer is capable of supporting analytical campaigns relevant to archaeological, historical or art historical

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