

Optical Laser Spectroscopies for Cultural Heritage

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Laser systems and technologies provide unrivalled tools for diagnostics, characterization, identification and restoration of museum and archival objects. New procedures and methods are constantly incorporated, in parallel with developments of optical technologies, for the investigation and control of the physical-chemical aspects of ageing and degradation of Cultural Heritage [1]. Photon sources are generated on table-top or mobile configurations and at large infrastructures (i.e. lasers, synchrotron) and offer the possibility to non-destructively image, characterize or sense, in situ or remotely, materials and artefacts. This contribution will focus on recent developments on optical laser spectroscopies, such as laser induced fluorescence (LIF) and laser induced breakdown spectroscopy (LIBS). These non-destructive or micro-destructive techniques provide information about the chemical composition of materials at the atomic or molecular level. It will be shown that, recently developed as portable instruments, these techniques allow the determination of a variety of organic and inorganic components in materials. A point also highlighted in the talk will relate with the increasing availability of compact, user-friendly, laser systems delivering ultrashort pulses of femtosecond duration ($1 \text{ fs} = 10^{-15} \text{ s}$) that facilitate novel solutions for non-invasive analysis of stratified substrates by non linear microscopy based in third harmonic generation (THG) and multi-photon fluorescence (MPF) and for precise processing (cleaning, protection, consolidation, etc.) with minimum thermal or chemical side effects.

[1] Proceedings of the 7th International Conference of Lasers in the Conservation of Artworks, M. Castillejo, P. Moreno, M. Oujja, R. Radvan, J. Ruiz (Eds.), CRC Press, London, 2008.