

ANALYTICAL CHARACTERIZATION OF LASER IRRADIATED PIGMENTS

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Non-destructive cleaning is a major concern in the conservation of works of art. Laser technology is presently an alternative cleaning method, but its application on paints still requires further research. In the present work we have studied the possibility of using laser cleaning on painting materials. A set of test samples with different pigments (Prussian blue, bone black, viridian green, chrome yellow, yellow ochre, vermilion, lead white and rose madder) dispersed in linseed oil have been prepared and artificially aged. The samples were then treated with an excimer laser operating at a wavelength of 248 nm, using different pulse energies, in order to understand the effect of the laser irradiation on the materials. A comparative study of pigment mixtures with different concentrations was carried out and their response to different laser treatments is reported.

Chemical changes induced on the surface of the samples were followed by energy dispersive X-ray analysis (EDX) and X-ray photoelectron spectroscopy (XPS). Colorimetry, infrared reflectivity and micro-Raman spectroscopies were also used to analyze the effects of the laser radiation on the sample surfaces. Their surface morphology was also studied by atomic force microscopy (AFM).

Controlled cleaning of paintings appears possible without damaging the artworks. In particular, laser irradiation of ~100 mJ/cm² did not seem to cause any chemical changes on the analysed samples, while for some of the pigments higher fluences induced some compositional changes, at least at the surface probed by XPS (~ 1-5 nm), showing that the laser energy has to be kept below a critical value to prevent damage.