

SIMONE PENTZIEN, ANDREA CONRADI, ROBERT KOTER
AND JÖRG KRÜGER

Cleaning of Soiled Paper Model Samples Using Short and Ultrashort Laser Pulses

Abstract

Paper is one of the most important materials representing and witnessing human culture particularly as a carrier medium for text and image. As soiling hampers the reception of information, paper cleaning techniques are needed. Traditional mechanical and chemical cleaning methods are used by conservator-restorers. In some cases, a classical cleaning procedure¹ of paper objects yields unsatisfactory results or a conventional treatment is even impossible. Especially, fragile paper objects cause problems due to mechanical instabilities.

Laser cleaning as a non-contact method might be a way to overcome some of the limitations of classical cleaning techniques. Laser parameters have to be chosen to achieve removal of the soiling without influencing the artwork. Any immediate as well as long-term effects causing an irreversible change of the artwork have to be avoided. At present, most laser applications are found in stone and metal conservation, while laser treatment of complex organic materials like paper is still not fully developed for application in conservators' workshops.

This contribution describes recent work of pulsed laser cleaning of soiled model samples. Pure cellulose, rag paper and wood-pulp paper were mechanically soiled with pulverized charcoal in a standardized procedure to make model samples representing essential characteristics of contaminated real-world artworks. Afterwards, model samples were cleaned using short and ultrashort laser pulses in the nanosecond and femtosecond time domain, respectively. An extensive analysis of the model samples after laser treatment using an optical microscope and

1 By eraser cubes, sponges, powders etc.

a multi-spectral imaging system allows a comparison of the cleaning results obtained with both laser sources.