

APPLICATION OF OPTICAL COHERENCE TOMOGRAPHY TO MONITORING OF LASER ABLATION OF VARNISH

Michalina Góra

Institute of Physics, Nicolaus Copernicus University, Grudziadzka 5, 87-100 Toruń, Poland

E-mail: misia@fizyka.umk.pl

Varnish layer removal is a crucial operation during the conservation of paintings. It has to be conducted with extremely high precision and selectivity. Preserving the original paint layers without modifying their original colours and structures is essential for this task. Despite of well established mechanical and/or chemical methods it is still a need for new solutions, dedicated to especially difficult cases. For instance, when the varnish layer is more chemically resistive then underlying paint layers, laser ablation of varnish seems to be very promising alternative. Prior to introduce this technique, which is still at experimental stage, to the common conservation practice, one of the most important issue to be resolved is an effective monitoring method of this process. The tracking method should be precise, fast, non-contact and should allow thickness estimation of remaining varnish layer in the region of ablation. This last requirement derives from the fact that thickness, topography and physical properties of both varnish and paint layers can vary rapidly from point to point.

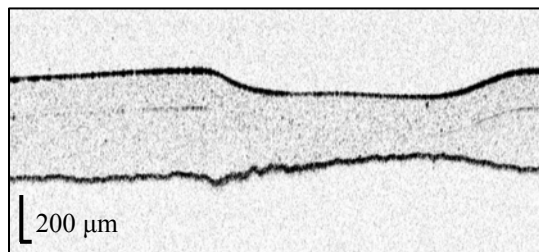


Figure 1. Frame from the OCT movies registered during ablation of the Maimeri Dammar varnish layer ablated with 8 Hz repetition. Laser pulses were applied at the centre of image, during the process sample were translated to the right.

Spectral domain OCT (SOCT) as a fast, sensitive, and non-invasive modality of structural imaging can be considered as a useful tool for real-time monitoring of various conservation treatments. In this contribution an overview of preliminary studies on application of OCT for monitoring of laser ablation will be summarised. Since this method gives both qualitative and quantitative information it is possible to visualise varnish layer structure as well as to generate surface profiles and varnish thickness maps. In this application OCT can be utilized in two steps. Firstly *in situ* estimation of process conditions like ablation rate for

given laser – varnish combination is used for planning of whole treatment. Then the real time monitoring of ablation makes this process safer for the object under treatment (Fig. 1).

The review of the recent results obtained can be a good introduction to the discussion about the potential of this method. The technical requirements like optimal resolution, imaging range, imaging speed, etc. will be addressed. On the base of the results obtained and the experience gained we will try to foresee the future of this application.

1. P. Targowski, J. Marczak, M. Góra, A. Rycyk, and A. Kowalczyk, "Optical Coherence Tomography for Varnish Ablation Monitoring", *Proc. SPIE* **6618** (2007).
2. M. Góra, P. Targowski, A. Kowalczyk, J. Marczak, and A. Rycyk, "Fast spectral optical coherence tomography for monitoring of varnish ablation process", *Lasers in the Conservation of Artworks, LACONA VII Proceedings* (in press).