

Experiences at the Academy of Fine Arts of Brera: the application of laser-cleaning technology on three case studies of the historical heritage

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The scientific research regarding conservation of gypsum plaster heritage is quite scarce; cleaning is often a problematic issue on this kind of material due to its water sensitivity and mechanical features. Therefore laser cleaning is often a good option as recent paper reported. [1,2]

The research presented here focused on laser cleaning of three gypsum plaster casts belonging to the collection of Brera Fine Arts academy and dated back to XIX century; recalling the names of the original marble statues, the items are the Flora Farnese, The Velletri Pallas and the Barberini Faun. The three casts were exposed since many decades in the entrance hall of the Academy in a semi-confined environment. Unfortunately, the continuous passage of students soiled the plaster surface with a grey greasy layer localized especially on the lower parts and on the surfaces with a strong horizontal component. It was possible to identify superficial grime and traces of the original patina. Marks of different nature (felt, pen, pencil, scratches) were also present. Cleaning tests were carried out using Thunder Art Nd:YAG able to emit both at 1064 nm and at 532 nm. The effects of laser cleaning were studied with a diagnostic campaign carried out both before and after the cleaning operation. To define the aspects and the nature of the surface, micro samples were sampled and analysed with XRD, XRF, then observed with a scanning electron microscope (SEM), and optical microscopy.

Several tests were carried out on the Flora Farnese, calibrating the fluence in order to match the ablation threshold avoiding any damage (from $FL = 1 \div 1.45 \text{ J/cm}^2$ at 1064 nm to $FL = 0.5 \div 0.7 \text{ J/cm}^2$ at 532 nm with repetition rate from 6 Hz to 10 Hz) in particular on these surfaces the removal of cement splashes constituted a hard task. A comparison between 1064 nm and at 532 nm tests were performed. Both tests were evaluated with the aid of humidification with free water (applied with brush) and with the use of AgarArt® rigid gel. On the basis of laser-plaster interaction observed on the Flora, the tests on the other casts excluded the IR radiation, because of a yellowing effect. For what regards the cast of the Pallas, one of the low relieves in the wooden support base was involved. The laser cleaning allowed the perfect removal of the outer layers of *scialbo*.

For the cast of the Faun, laser cleaning proved to be the appropriate system to eliminate greasy deposits and dark grey stains visible on the irregular surface, maintaining the original morphology. Hence it was possible to avoid invasive mechanical and chemical systems, minimizing the interaction with the matter and saving working time. The aim of this work is to provide a contribution to the scientific researches by the point of view of a Fine Arts Academy, which is starting to build a database for the conservation products and methods about such a known and used material as plaster, which is not sufficiently studied.

[1] C. de Oliveira, P. Bromblet, A. Colombini, V. Vergès-Belmin, "Medium-wave ultraviolet radiation to eliminate laser-induced yellowing generated by the laser removal of lamp black on gypsum" in LACONA X, 9-13 giugno 2014.

[2] M. Anzani, L. Borgioli, A. Brunetto, A. Rabbolini, A. Sansonetti, J. Striova, "Sperimentazioni di pulitura laser con la intermediazione di gel di agar" in APLAR 3, applicazioni laser nel restauro, atti del convegno, Bari 18-19 giugno 2010.
