

PO1075

## Use of a novel cold RF atmospheric pressure plasma jet as a cleaning and restoring tool for daguerreotypes

Paolo Scopece<sup>1</sup>, Alice Delva<sup>2</sup>, Emanuele Verga Falzacappa<sup>1</sup>, Sandra M Petrillo<sup>3</sup>,  
Alessandro Patelli<sup>4</sup>, Paolo Ugo<sup>2</sup>

<sup>1</sup>Nadir S.r.l., Venezia, Italy <sup>2</sup>Department of Molecular Sciences and Nanosystems, University Ca'Foscari of Venice, Venezia, Italy <sup>3</sup>SMP Photoconservation, Genzano di Roma, Italy <sup>4</sup>Department of Physic, University of Padua, Padova, Italy

scopece@nadir-tech.it

The daguerreotype is the first example of photographic technique that reached a worldwide circulation around 1850. Each daguerreotype is a unique and irreproducible image that presents high detail and clarity still unmatched by any other photographic image. The image is formed by silver-mercury amalgam particles produced by photosensitization and following development of a plate made of copper and silver, sensitized with silver iodide and developed with mercury vapours and eventually stabilized by gilding. Resulting artefact is particularly fragile and, if in contact with the environmental atmosphere, can be easily oxidized leading to the formation of silver oxides and silver sulfides. Typical cleaning techniques include the use of chemical reagents, of electrochemical processes or laser equipments. However, such techniques present several drawbacks: can leave residues, require the use of electrolyte solutions, or may cause the partial removal of the outermost layer of the surface of the daguerreotype.

In this work a new atmospheric pressure plasma jet (APPJ) source, has been used and evaluated as innovative technique for cleaning and restoring daguerreotypes. Results on removal of biological material, cleaning and reduction of oxidised and sulphide layers are here presented as a function of several treatment parameters, together with the characterisations obtained by using non-invasive techniques such as: SEM-EDX, optical profilometry, photography in visible, grazing, and UV light, optical and metallographic microscopy. The obtained results confirmed that the novel proposed APPJ device is an effective cleaning tool, particularly respectful of the delicate daguerreotype surface and of the silver and amalgam microparticles that compose the image, allowing the localized tuning of the cleaning procedure.

### Keywords

APPJ

Plasma Cleaning

Daguerreotype

Silver reduction