

Characterization of a Surface Tarnish Found on Daguerreotypes Under Shortwave Ultraviolet Radiation

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ABSTRACT

A characteristic fluorescent tarnish can be observed on some daguerreotypes under shortwave ultraviolet radiation. The fluorescence can be seen in several distinct patterns: edge tarnish, rings, and continuous films. The tarnish has been observed on the fronts and backs of daguerreotypes on electroplated and roll-clad plates. The tarnish also can be seen on the backs of brass mats and on mat bevels. The fluorescent tarnish was observed on heavily tarnished plates as well as plates that showed minimal tarnish. In some cases the fluorescence corresponded to brown staining on the daguerreotype under normal and specular illumination. Test plates were created based on early experiments by Lee Ann Daffner (1996) and Claire Buzit Tragni (2005). A fluorescent tarnish, similar to the tarnish seen on historic plates, formed on bare copper plates exposed to a solution of sodium cyanide. Dispersive Raman spectroscopy, scanning electron microscopy (SEM), and X-ray diffraction (XRD) were applied to characterize and identify the fluorescent compound on the test and historic plates. Raman spectroscopy identified the characteristic peak for copper cyanide, CuCN, at 2172 cm^{-1} . Elemental k-ratio maps of the SEM analysis indicated an increase in copper, carbon and nitrogen in the area of fluorescence. Powder XRD was capable of identifying the copper cyanide compound on a test plate but was not sensitive enough for detection on a historic daguerreotype. Cyanide could have been introduced to the daguerreotype process by at least six different historical procedures in its creation as well as restoration. Shortwave ultraviolet radiation thus can be added to the methods of characterization in any long term monitoring program of daguerreotypes' stability.