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Analysis of Historical Tintype Plates: Materials, Methods, and Manufacturers

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The tintype, a wet collodion photograph on a japanned metal support, became the most popular photographic technique in mid-19th century United States of America due to its durability, low cost, and the societal demands of the American civil war. Tintype plates consisting of a metal sheet with a protective varnish on the verso and the colored japanning layer on the recto were commercially available: at least 10 manufacturers are represented in trade advertisements of the time, and some offered plates with differently colored japanning layers (i.e. chocolate or black) or with different surface textures (glossy or eggshell). Despite the plenitude of manufacturers, and the production of millions of these cultural heritage objects, there is a dearth of information regarding what materials were actually used to create tintype plates. Two patents dating from 1856, the natal year of the process, list iron as the support material, and linseed oil, Japan varnish and colorants such as lamp-black, umber and asphaltum, as the constituents of the japanning layer. A third patent dating from 1870 cites the use of linseed oil and India red. However, japanning of tinware and leather was common and contemporary literature cites the use of shellac and other resins instead of (or in addition to) linseed oil, and so in an effort to maximize profit manufacturers may have used materials other than those cited in the patents. As part of an ongoing, comprehensive study on the material nature of tintypes, the metal supports and japanning layers of a study collection of 226 tintypes were analyzed by pyrolysis gas-chromatography (py-GC-MS), X-ray fluorescence spectroscopy (XRF), and microscopy. The predominant component of the japanning layers is drying oil, although some japanning layers also contain Pinaceae resin or shellac (64% and 3.5% of the collection, respectively). The primary material identified in the metal support is iron, although 22% of the collection also contain manganese. Dispersed sample microscopy revealed that the most common colorants in the japanning layer are iron oxide species and carbonaceous pigments, while py-GC-MS revealed only a limited use of asphaltum. The iron in the japanning layer may also have helped serve as a drier, as may the manganese and lead detected by XRF in 8% and 5% of the collection, respectively. Microscopy and cross-section analysis revealed that some japanning layers contain only a single homogenous layer, while others have been built up from multiple coats of material, with the lowest layer being the most highly pigmented. This densely pigmented layer likely corresponds to the 'black face coat' described in the sole historical essay describing plate manufacture. This first comprehensive analysis of tintype plates shows that the majority of plates differ from the patent literature in terms of the organic binders utilized. These results also reveal that the plate manufacturing process evolved through time and that different manufacturers used different formulations of materials to create their plates. Therefore, it may be possible to create 'profiles' for a given manufacturer- perhaps providing a date range for when a given plate was produced.

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