

CHARACTERIZATION AND DATING OF HISTORIC SILVER GELATIN FIBER BASED PHOTOGRAPHIC PAPERS USING X-RAY FLUORESCENCE SPECTROSCOPY AND CHEMOMETRICS

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X-Ray Fluorescence Spectroscopy (XRF) is a non invasive technique commonly used to examine photographs and identify the printing process, but it can also reveal a great deal of information on the paper itself, namely on the nature and abundance of inorganic fillers, pigmented coatings and additives. The presence of certain key elements in the paper is useful for example for comparative purposes¹, as well as to be used to determine the production method or establish a manufacturing date or period^{2,3} by comparing with other photographs in a reference set.

A group of 300 fiberbased gelatin prints from The Museum of Modern Art (MoMA) Film Stills Archive dated between 1910s and 1980s was used as a reference set to identify possible key elements and develop an experimental dating method based on XRF analysis and chemometrics. Partial Least Square (PLS) analysis was used to develop an experimental dating method based on the correlation of the spectra with the year the photographs were printed. A prediction error (RMSE) of 7 years was achieved by using the appropriate spectra pre-processing algorithms. This error is short of ideal and comparable to the other methods based on NIR⁴ and ATR-FTIRS⁵ previously developed, but these approaches are a valuable tool to assist conservators, curators and scholars to establish the context or chronology of a photographic print. Based on the elements identified by XRF and a literature review, a plausible list of fillers, coatings, pigments is being assembled and classification methods will then be used to establish a timeline for the use of these compounds in the manufacture of photographic papers.

References:

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