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Quantitative XRF Study of Baryta Coated Photographic Paper

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A series of selected samples from a reference collection of 20th century baryta coated photographic paper were analyzed using quantitative X-ray fluorescence spectrometry (XRF). The purpose of the study was to assess the potential of quantitative XRF analysis, used alone or in combination with other physical or chemical characteristics, for provenancing of photographic papers.

Each selected unexposed photographic paper was fully fixed to remove silver from the photographic emulsion and analyzed to determine concentration of barium (Ba) and strontium (Sr) using a portable XRF spectrometer (NITON 700) working in the quantitative thin film mode. The radioactive americium source (Am-241) was used for quantitative determination of barium and cadmium (Cd-109) was used for analysis of Strontium. Both results were tabulated together with a calculated concentration ratio (Ba/Sr) and other known data on photographic papers (manufacturer, production date, brand, thickness and surface finish).

Results of our study show that concentrations of barium and strontium are very uniform across the plane of a single photographic paper. Concentrations are also very consistent across multiple sheets of photographic paper randomly selected from their original commercial package. While results show that barium and strontium levels are consistent for a given paper made during a certain time period, quantitative XRF data also show some significant differences emerge across manufacturers, date, brand and surface finish. These data indicate that baryta coated photographic paper produced over time differs enough in all determined analytical parameters that a quantitative XRF can provide important clues needed for the development of any future provenancing methodology. A systematic quantitative XRF analysis of more then 1500 samples of historic photographic paper will follow to fully test this working hypothesis by creating a baseline of XRF data against which papers of unknown or questioned provenance can be compared.

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