

Analytical studies of XIX century photographs by non-destructive techniques

Marília Peres¹, Luís Dias², José Mirão^{2,3}, Teresa Ferreira^{2,4}, Luísa Carvalho⁵, Estela Jardim⁶, Fernanda Costa¹,

¹Centro de Ciências Moleculares e Materiais, Universidade de Lisboa, Campo Grande, 1749-016 Lisboa, Portugal

²HERCULES - Cultural Heritage Studies and Safeguard Centre, Universidade de Évora, Largo Marquês de Marialva 8, 7000-809 Évora, Portugal.

³Évora Geosciences Centre, Universidade de Évora, 7000-676 Évora, Portugal.

⁴Évora Chemistry Centre, Universidade de Évora, 7000-676 Évora, Portugal.

⁵Centro Física Atómica, Un. de Lisboa, Av. Prof. Gama Pinto, 2, 1649-003 Lisboa, Portugal

⁶Centro de Filosofia das Ciências, Un. de Lisboa, Campo Grande, 1749-016 Lisboa, Portugal

mariliaperes@ciberprof.com

The late 19th century photographs are chemically a multilayer material of several inorganic and organic compounds. The observed composition variety is a consequence of the large number of photographic products and processes that were used in those days as well as result of ageing effects. The data about the chemical composition of a photographic material can be very useful in determining its age and authenticity as in searching for appropriate restoring techniques or storage protocols.

Most of the conservation work has been done based on artistic evaluation. Nevertheless, during the last decade, non-destructive analytical techniques have been associated with microscopic and visual methods for the identification and conservation of photographs and photographic emulsions.

In this work, analytical studies were performed on three selected 19th century photographs: a multi-technique non-destructive approach was used to determine the composition and degradation status of the selected photographic samples. Reflectance Fourier-Transform Infrared Spectroscopy allowed the identification of a protein material as well as the chemical nature of the protective material layer. The surface morphology and homogeneity of uncoated samples were analysed in a variable pressure Scanning Electron Microscope (SEM-EDS) coupled with a Bruker X-Ray Energy Dispersion Spectrometer used for elemental composition estimation. X-Ray Fluorescence Spectroscopy (EDXRF) was also used for the *in-situ* analysis of the samples.

References:

- CATTANEO, B. et al (2008). "Physico-chemical characterization and conservation issues of photographs dated between 1890 and 1910". *Journal of Cultural Heritage*, 9: 277-284.
- RICCI, C. et al (2007). "ATR-FTIR imaging of albumen photographic prints". *Journal of Cultural Heritage*, 8: 387-395.
- MARTINS, A. et al (2012). "Non-destructive dating of fiber-based gelatin silver prints using near-infrared spectroscopy and multivariate analysis". *Anal Bioanal Chem*, 402: 1459-1469.