

# Alteration phenomena occurring in modern oil paints: non-invasive and micro-invasive spectroscopic investigations on Cobalt Blue paint films

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This research aims to understand the alteration phenomena occurring in modern oil paints containing Cobalt Blue with a special attention to the interactions between the organic binder and the inorganic compounds present as pigments, additives, fillers, etc. The results here presented concern the non-invasive and micro-invasive characterization of several oil films before and after an accelerated ageing. Paints tube from Titan (Spain), Royal Talens (Netherlands), Winsor & Newton (United Kingdom) and Maimeri (Italy) were artificially aged by modifying the thermo-hygrometric conditions. The characterization was performed by means of external reflection infrared spectroscopy (ER-FTIR), Colorimetry, Visible Reflectance,  $\mu$ -ATR (both on the surface and on the cross-section) O.M. and SEM-EDS.

The experimental work was divided in two steps. The former included a thorough characterization of each component of the tubes, *i.e.* binding media, pigment, fillers and other additives. The latter concerned the study of the paint films which underwent accelerated ageing under different relative humidity conditions (RH 30% and 90%) and in the presence and absence of daylight for 56 days. Experimental data had shown that the different RH conditions promote and/or accelerate the formation of metallic soaps. Additionally, depending on the chemical composition of additives and fillers, different paints oil tubes are subjected to different alteration phenomena. In particular,  $\mu$ -ATR performed on cross section has allowed to understand the distribution of metal soaps across the paint layer, highlighting the presence of carboxylates close to the exposed surfaces.

Moreover, the present experimentation has assessed ER-FTIR as a valid non-invasive and contactless diagnostic technique to detect alteration products in modern paints.