Surface-enhanced Raman Scattering of synthetic organic pigments

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Synthetic organic pigments have been mostly used as artist’s materials since the 1950s. Predominant chemical classes are azo pigments (reds, oranges and yellows), phthalocyanines (blues and greens) and quinacridones (violets, reds, oranges) and to a lesser extent dioxyzine, perylene and anthraquinones. Besides serving as colorants, some of these synthetic pigments are technologically very important due to their properties as photosensitizing agents and light emitters. Their detection in the small quantities they are present either in artworks or in doped-dye photovoltaic and electroluminescent devices has a real interest.

Chromatography and mass spectrometry are the mostly used analytical techniques employed for the identification of some of these synthetic organic pigments in real samples, but they require rather large quantities of sample, complex extraction methods and are not always successful. Thus, Py-GC-(MS) is quite adequate for the investigation of pyrolytic fragments of most azo pigments but inadequate for the investigation of quinacridones. The capabilities of Laser Desorption Mass Spectrometry (LDMS) for detection of synthetic organic pigments have been also investigated [1], concluding that analysis is not straightforward and is not of general use.

On the other side, vibrational spectroscopy (Raman and Infrared) are able to provide molecular identification, and have been also used. But these techniques also fail in some cases either because of the lack of sensitivity of the technique (Raman) or because the high fluorescence of the pigment (Raman) or the spectra (Infrared) of the complex medium where the pigments are dispersed (filling, binders, etc.) hide the spectrum of the pigment.

In this scenery and following our experience in the application of the Surface-enhanced Raman Scattering technique (SERS) to the molecular identification of natural organic pigments such as anthraquinones [2] and flavonoids [3], we have accomplished the SERS study of some phthalocyanines (Pc) and quinacridones (QCD). In this work we report the first SERS results obtained for the Pc(H2) and the quinacridonequinone.

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