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When performing SERS on a sample, some authors have found it advantageous to treat the sample with an acid to hydrolyse lake pigments or generally break the bond between dye and its substrate. This procedure allows the dye molecules more easily to diffuse into the colloid drop and adsorb on the surface of the nanoparticles. In a recent development of the technique, a gelatine nanocomposite is prepared and put on the spot to analyse; after the analysis, the gelatine can be peeled off and removed without leaving either a mark visible to the naked eye, or traces of the metal nanoparticles. However, the gelatine is slightly wet and this may be an issue with water-soluble pigments and dyes or on water-sensitive substrates.

What is SERS good for?

SERS has been used extensively in museum laboratories for the analysis of a variety of cultural heritage objects spanning a large geographical and chronological range and covering all types of materials, including textiles, prints, drawings, paintings, and polychrome sculpture.

The bulk of the published examples concerns red anthraquinone dyes such as carmine and madder. For example, SERS was used to document the oldest known so far example of a lake pigment made from madder, in an Egyptian leather fragment dating to the Middle Kingdom (Fig. 2), as well as the first occurrence of lac dye in western European art, in a Romanesque sculpture from Southern France.[3]

SERS is equally suitable to the analysis of textile fibres, watercolor and tempera paints, and lake pigments in oil (for an example of the latter, see ref. 4).

SERS has been applied, in addition to anthraquinones such as madder, cochineal, kermes, and lac dye, to all major natural colourants used as textile dyes and lake pigments, and to a good number of synthetic ones (see for instance ref. 5–7). A summary list would include weld, fd

Analysis of spectra