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Identification of inorganic dyeing mordant in textiles by surface-enhanced laser-induced breakdown spectroscopy

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ABSTRACT

The identification of both the organic and inorganic fraction of dyes and pigments is fundamental for their complete characterization and to assess the technologies used in their production.

In this work, the feasibility of determining metallic elements used as mordant for dyed textiles was tested using Laser-Induced Breakdown Spectrometry (LIBS) in combination with liquid micro-extraction. Both reference laboratory-dyed and historic textiles were analysed in this study. Samples were first analysed without any preparation. Then, the chromophores-containing molecules were separated using a sample preparation procedure based on aqueous hydrolysis, and analysed by high-pressure liquid chromatography coupled with a diode array detector. The same extracts, containing also the inorganic fraction, were analysed by Surface-Enhanced Laser-Induced Breakdown Spectroscopy (SENLIBS) after drying on a solid substrate.

Compared to the direct analysis, the SENLIBS method improved the sensitivity of the measurements. The procedure presented here allowed for the characterization of both organic and inorganic fraction of a single textile micro sample, thus avoiding further sampling.

Keywords

Textiles; Mordant; Surface-Enhanced LIBS; HPLC-DAD

Highlights

- Combination of liquid analysis with surface enhanced LIBS.
- Elemental analysis in textile samples after micro-extraction procedure.
- Organic fraction characterized by HPLC-DAD.
- This method improved the sensitivity of LIBS in liquids analysis.

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