

Mapping natural dyes in archeological textiles by imaging mass spectrometry.

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Abstract

Organic dyes of animal and plant origin have often been used by our ancestors to create textiles with polychromic ornamental patterns, and dyestuff analyses reveal how ancient cultures used these natural colorants. Mass spectrometry can characterize ancient colorants from these textiles, but its combination with separation techniques such as liquid chromatography requires the destruction of the pattern to extract organic dyes from the fabrics. In this study we applied mass spectrometry imaging (MS imaging) on colorful patterned textiles to show the spatial distribution of indigo-type and anthraquinone-type dyes. We evaluated different sample preparation techniques for matrix-assisted laser desorption/ionization time-of-flight (MALDI-TOF)-MS imaging, e.g. the production of imprints in TLC (thin layer chromatography) aluminum sheets and the embedding of the material in Technovit7100 to produce thin sections. Our protocol enabled the detection of

indigo-type dyes directly on a historic textile of more than 2,000 years old embedded in Technovit7100. This is the first-time application of MALDI-TOF-MS imaging to map different organic dyestuffs on archeological remains.

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