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ORIGINAL PAPER

A multi-analytical approach to amber characterisation

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Increased need for non-destructive investigation methods in archaeology has become a major issue since sampling is in most cases restricted in view of the importance or uniqueness of the objects. For this reason, preliminary investigation using non-destructive techniques was performed on five samples of amber beads obtained from different excavation and archaeological sites. The use of FTIR and micro-Raman analysis revealed the presence of carboxyl, peroxide, hydroxyl, and complex ester functional groups as well as single and double bonds in the structure of the studied resin varieties. Further analysis of the amber samples from both archaeological and geological types by XPS, XRF, and SEM showed the presence of sulfur and a wide range of trace elements on the surface of the analysed samples. Our results proved that the combination of structural-molecular and surface elemental techniques for amber characterisation provides a very useful and simple methodology for the description of geological and archaeological amber samples from different regions of Europe.

Keywords: amber, infrared spectroscopy, scanning electron spectroscopy, X-ray photoelectron spectroscopy

Introduction

Fossil resin is a solid organic matter, mainly insoluble in water, which is derived from resins of different types of conifers and flowering trees and has suffered from chemical transformations during its deposition in various sediments for a long span of time resulting in different degrees of maturation (Anderson & Crelling, 1996). The expression 'amber' is principally regarded as a collective term including solidified resins of various origin, composition and colour. Deposits are found in several regions around the world and probably originate from more plant families than presently known from the fossil database. Amber is a part of a wide group of archaeological finds whose analysis reflects the economic, social, religious, and other cultural aspects of the society which made and used it as jewellery, family goods, and ceremonial items (Anderson & Crelling, 1996; Langenheim, 2003). Its chemical properties are a result of both its biological origin and geological environment in which it was deposited and has subsequently matured. Hence, it is important to take these factors into account when assessing the properties and characteristics of these materials. For this reason, the aim of this research was to provide chemical information about two types of amber, including structural and elemental surface characterisation. The material considered in this work was divided

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