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Application of pyrolysis-comprehensive gas chromatography/mass spectrometry for identification of Asian lacquers

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Abstract

A new approach based on online pyrolysis-comprehensive gas chromatography/mass spectrometry (Py-GCxGC/MS) is introduced for analysis of lacquer saps with potential applications to analysis of Asian lacquers. The bidimensional GCxGC separation demonstrated its benefits for characterization of the markers of lacquer saps, alkylhydrocarbons, alkylbenzenes, alkylphenols, and alkylcatechols, in a visual way not attainable in monodimensional Py-GC/MS analysis. Moreover, the potentiality offered by GCxGC allows the separation of regioisomers difficult to obtain with a monodimensional separation. Under these circumstances, urushiol (Japanese, Chinese), laccol (Vietnamese), and thitsiol (Myanmar) lacquer sap films were differentiated by their marker fingerprints with a limit of detection in the low μg range. Additionally, thermally assisted pyrolysis with tetramethylammonium hydroxyde (TMAH) clearly differentiated the alkylcatechol markers of the four lacquer samples investigated, with a net separation of stereoisomers particularly well exemplified in the case of the Myanmar lacquer sample. The proposed Py-GCxGC/MS approach greatly facilitates the analysis of Asian lacquer saps, and is very promising for sensitive detection of lacquers in archaeological artifacts.

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