Identification of Proteinaceous Binding Media Used for Paintings by Capillary Electrophoresis with Electrospray MS Detection

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Capillary electrophoresis (CE) coupled with electrospray mass spectrometry (ESI MS) has been applied for identification of gelatin, casein, and egg yolk used as proteinaceous binding media in the works of art. The conditions of CE separation have been optimized using the mixtures of amino acids standards reflecting their ratios in native proteins. Ultraviolet detection has been found unsuccessful for identification of amino acids obtained after hydrolysis of the parent proteins. In contrast, CE coupled with ESI MS allowed one to unambiguously identify the components of real samples of proteinaceous binders after hydrolysis. Identification of the binding media was based on the occurrence of characteristic signals in the mass spectra corresponding to molecular ions of tyrosine (m/z 182) from egg-yolk and casein, of cystine (m/z 241) from egg-yolk, and of hydroxyproline (m/z 132) from gelatin, as well as on the evaluation of mass profiles of amino acids detected in the analysed samples. A new procedure for distinguishing hydroxyproline from leucine and isoleucine (amino acids of equal molecular masses and electrophoretic mobility) has been developed. It is based on a significant increase of the orifice voltage in the electrospray source, causing total fragmentation of two latter compounds. The developed method has been applied to identification of proteinaceous binding components of test painting layers.

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