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Marcello Manfredi, Elettra Barberis, Maurizio Aceto, Emilio Marengo

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Non-invasive Characterization of Colorants by Portable Diffuse Reflectance Infrared Fourier Transform (DRIFT) Spectroscopy and Chemometrics

Marcello Manfredi[1, 2], Elettra Barberis [1, 2, *], Maurizio Aceto[1], Emilio Marengo[1]

[1] Dipartimento di Scienze e Innovazione Tecnologica, Università del Piemonte Orientale, viale Teresa Michel 11, Alessandria, Italy.
[2] ISALIT S.r.l., Via A. Canobio 4/6, Novara, NO, Italy.
[*] Corresponding author: elettra.barberis@uniupo.it; +39 0131229332

Abstract

During the last years the need for non-invasive and non-destructive analytical methods brought to the development and application of new instrumentation and analytical methods for the *in-situ* analysis of cultural heritage objects. In this work we present the application of a portable diffuse reflectance infrared Fourier transform (DRIFT) method for the non-invasive characterization of colorants prepared according to ancient recipes and using egg white and gum Arabic as binders. Approximately 50 colorants were analyzed with the DRIFT spectroscopy: we were able to identify and discriminate the most used yellow (i.e. yellow ochres, lead-tin yellow, orpiment, etc.), red (i.e. red ochres, hematite) and blue (i.e. lapis lazuli, azurite, indigo) colorants, creating a complete DRIFT spectral library. The Principal Component Analysis – Discriminant Analysis (PCA–DA) was then employed for the colorants classification according to the chemical/mineralogical composition. The DRIFT analysis was also performed on a gouache painting of the artist Sutherland" and the colorants used by the painter were identified directly *in-situ* and in a non-invasive manner.

Keywords: Non-invasive analysis; colorants characterization; DRIFT spectroscopy; Surface analysis; In-situ technique; Chemometrics