

SIMULTANEOUS IDENTIFICATION OF DYES AND BINDING IN GRAPHIC DOCUMENTS BY CAPILLARY ELECTROPHORESIS

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INTRODUCTION

Chemical analysis of graphic documents is a common procedure for their care, conservation and restoration, and the amount of analytical work done in this area has increased recently with the development of new analytical techniques.

Most graphic documents on parchment and paper had been written and illustrated using water-based techniques such as watercolour or gouache where arabic gum was used as binding and dyes or pigments were the elements that provided colour to the inks.

EXPERIMENTAL

Analytical methods for the identification of these components must be highly selective and sensitive because of the complexity of the matrix and the limited amount and size of sample available in the case of graphic documents and archival material. For this reason, in this work capillary electrophoresis with diode array UV-Vis spectrophotometric detection (CE-DAD) has been selected for developing a simple and rapid method for the identification of dyes and gums.

The dyes used like reference substances were obtained by extraction from different sources: red carmine from *Coccus cacti* insect, madder lake from *Rubia tinctorum* root and brazilwood from *Caesalpinia echinata* tree. The binding chosen as a reference has been arabic gum (from *Acacia senegal* tree). The method has been applied to the samples prepared at the laboratory composed by inks applied on paper. The sampling was carried out using a brush impregnated with adequate solvent rubbing directly onto the surface of paper.

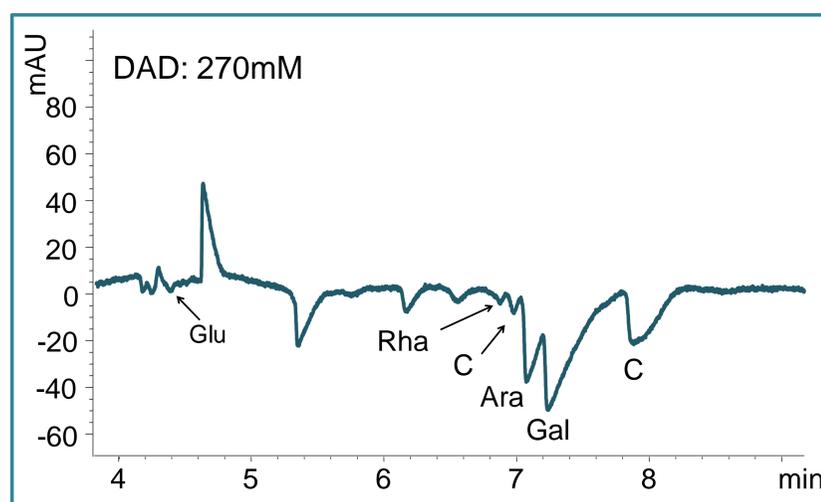
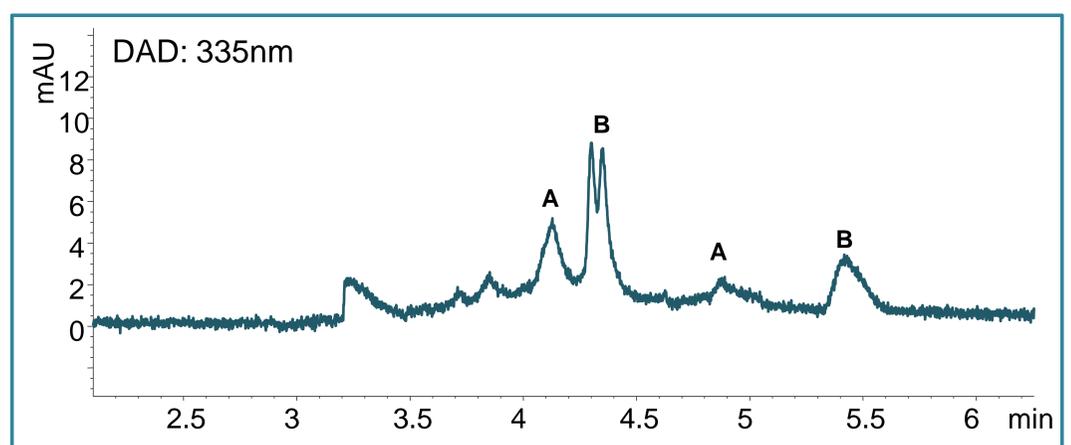
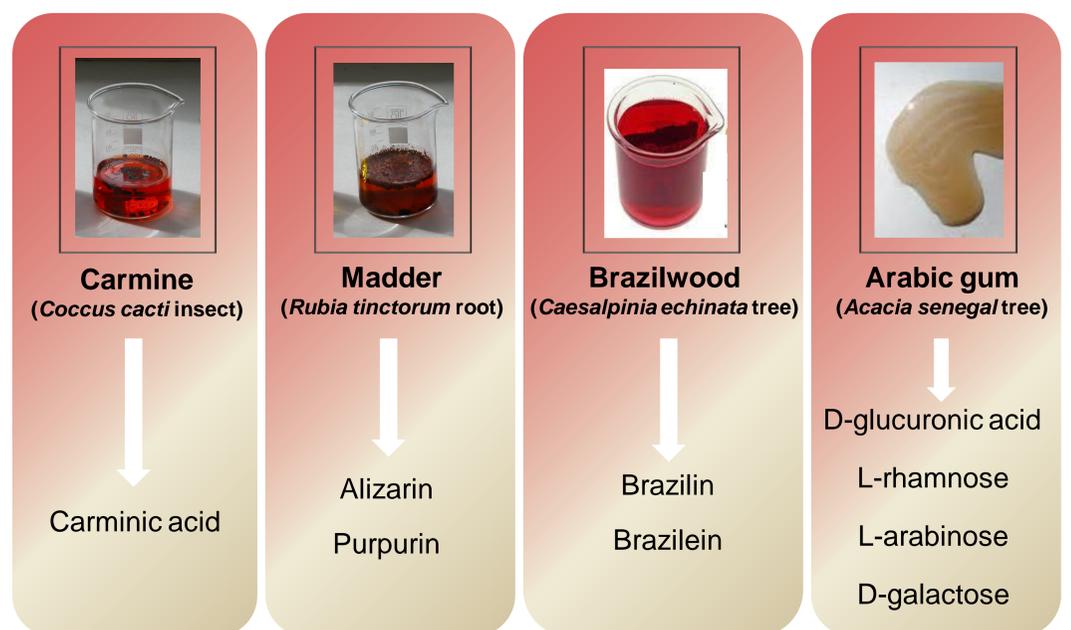
Optimal conditions for Capillary Electrophoresis

Capilar	36 cm x 50 µm I.D.
Buffer	40mM PDC + 20mM PO ₄ ⁻³ + 0,5mM CTAB
pH	12,1
Voltage	-10kV
Temperature	20°C
Injection	Hydrodynamic 50mbar, 2s
Detection	270nm, 335nm

The main advantages of the developed method are that only small amount of sample is required, sample treatment is simple and analysis time is short. In fact gums and dyes can be identified by a single analysis of one single sample, which means that sampling is reduced considerably in order to identify the principal compounds. Also the proposed sampling technique does not damage the artefact.

CONCLUSIONS

The knowledge of the elements that constitute graphic documents facilitates dating, identifying and also help to understand the evolution of the techniques used in their production. Moreover, from the point of view of documental heritage conservation, analysis and scientific knowledge of materials and techniques used in the documents are of paramount importance to determine the best conservation conditions and restoration treatments.



DYES

A: carmine;
B: brazilwood
C: Madder

BINDING

Glu: Glucuronic
Rha: Rhamnose
Ara: Arabinose
Gal: Galactose

Acknowledgments

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