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An approach to cleaning methods and materials for painted alabaster

The relief of Saint Jerome Penitent from the Cathedral of Salvador in Zaragoza (Spain)

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An approach to cleaning methods and materials for painted alabaster

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Introduction

- 1 This research is aimed to obtain a deeper understanding of some chemical properties (pH conductivity and water sensibility) of painted alabaster sculptures as well as some of their ageing mechanisms in order to design cleaning protocols which take into account the particular changing nature of these dynamic and complex systems.
- 2 A 16th century alabaster relief of Saint Jerome from the Cathedral of Salvador in Zaragoza, Spain, was taken as a case study and pH, conductivity and water solubility of their painted films has been measured and discussed.

Fig.1 Saint Jerome Penitent



Fig.1: 16th century relief of Saint Jerome Penitent from Cathedral of Salvador in Zaragoza (71,5 cm x 61,5 cm x 11 cm)
© Photo: Christopher Marques

16th century relief of Saint Jerome Penitent from the Cathedral of Salvador in Zaragoza (71,5 cm x 61,5 cm x 11 cm).

© photo Christopher Marques

The changing properties of painted alabaster during aging

- 3 In addition, materials of the case study have been characterised with analytic technics such as light microscopy, Fourier transform infrared spectroscopy, x-ray diffraction, x-ray fluorescence and scanning electron microscopy. Glass slides as well as mock-ups on alabaster, wood, and linen, were elaborated with some of the film forming materials found in the case study and aged. The changing pH, solubility and conductivity of their surface, before and after ageing, have been studied.
- 4 The behaviour of the polychromies on stone will depend on the specific painted materials used, the type of stone and the surrounding environmental conditions. The accumulation of soils on the surface of the painted layers on alabaster could also modify the composition of the painted film.
- 5 This combination of factors would dictate the chemical reactions that will eventually take place, with new chemical equilibriums being successively reached. A number of physical and chemical reactions can then occur in an unpredictable way. New and sometimes unexpected inorganic, organic and mixed products can be formed during such chemical-physical reactions. The processes leading to the formation of these by-products on painted alabaster have not been fully understood yet but cause degradation over time and induce significant changes in properties such as pH, conductivity and solubility.

- 6 During our research we've realize that painting materials don't react over time with alabaster as they do with other organic or even inorganic supports. Exactly the same mixture of binder (oil or glue) and pigment appears to react differently whether the support is alabaster or a canvas with a ground of gypsum or chalk: the pH used to be similar to gypsum ones and higher than chalk ones but the conductivity of the films on alabaster used to be always too much lower.
- 7 Our results about pH, conductivity and solubility were obtained through standardized agarose gels being in contact with the surface for a fixed time range. They are not values obtained by direct measurements and they are not absolute but relative values about pH and conductivity.

Fig. 2 Alabaster, oil and verdigris








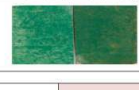






Alabaster + Oil + Verdigris (AOCuV)		pH	Conductivity
	AOCuV 1 Before aged	6,01	520 µS
	AOCuV 2 After aged (T+ RH) + UV	5,91	250 µS
Stratigraphy		Hydrophilicity / adsorption	Water sensitivity
AOCuV 1			Not sensitive (+30 rolls) 
AOCuV 2			Not sensitive (+30 rolls) 
Linen canvas + Chalk & glue ground + Oil + Verdigris (LeOCuV)		pH	Conductivity
	LeOCuV 1 Before aged	5,63	2200 µS
	LeOCuV 2 After aged (T+ RH) + UV	5,78	2300 µS
Stratigraphy		Hydrophilicity / adsorption	Water sensitivity
LeOCuV 1			Very sensitive (5 rolls) 
LeOCuV 2			Very sensitive (5 rolls) 

Fig. 2. Aged Mock-ups oil and verdigris film on alabaster and on linen with chalk glue ground.
© photo Christopher Marques

Aged Mock-ups oil and verdigris film on alabaster and on linen with chalk glue ground.

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Surface cleaning as a function of surface properties

- 8 The removal of soils and other substances deposited over time on painted surfaces is one of the treatments conservators usually must deal with when treating painted alabaster. Since these treatments involve direct contact with the films, they might have consequences that affect not only the material integrity of the sculpture but also the visual appearance of its surface. Therefore, prior their removal on painted surfaces, a good understanding of the forces of adhesion between the surface and the soils, the properties of the surface and the environmental conditions is necessary. As important as this prior knowledge about the surface is to control the properties, the form and the

movement of our cleaning materials in order to create management strategies that minimize the risk for the surface.

Conclusion

- 9 According to this, common surface cleaning protocols developed for painted surfaces on other supports might not suit well for the same kind of films on stone and especially alabaster, since the properties that the polychrome layers acquire over time are different according to the type of support, the painting materials and the environmental conditions.
 - 10 This is a preliminary step to understand and develop an approach to cleaning methods and materials for painted alabaster that respects and preserves the properties of such materials but, equally interesting, that guarantees the absence of toxicity for conservators.
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ABSTRACTS

This research is aimed to obtain a deeper understanding of the chemical properties of painted alabaster sculptures as well as some of their ageing mechanisms in order to design cleaning protocols which take into account the particular changing nature of these dynamic and complex systems. Materials and some chemical properties (pH, conductivity and water solubility) of the case study have been characterised. Glass slides as well as mock-ups were elaborated and aged on alabaster, wood, and linen, with similar film forming materials as those that have been found in the case study.

Cette recherche vise à obtenir une meilleure compréhension des propriétés chimiques des sculptures en albâtres polychrome ainsi que certains de leurs mécanismes de vieillissement afin de concevoir des protocoles de nettoyage, qui tiennent compte de la nature changeante de ces systèmes dynamiques et complexes. Les matériaux et les propriétés chimiques (pH de conductivité et solubilité dans l'eau) de la sculpture étudiée ont été caractérisés. Des lamelles de verre ainsi que des maquettes en albâtre, le bois et lin, ont été élaborés avec des matériaux filmogènes trouvés dans la sculpture étudiée et postérieurement vieillis.

INDEX

Mots-clés: pH, conductivité, sensibilité à l'eau, polychromie, albâtre, nettoyage, surface

Keywords: pH, conductivity, water, sensibility, polychromy, alabaster, cleaning, surface, cleaning

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