

Marta Bellato et al.

X Congresso Nazionale AIAR
Torino, 14-17 Febbraio 2018

Novel approach for characterising archaeological textiles exceptionally preserved in a mineralised form based on 2D and 3D synchrotron micro-imaging

Marta Bellato ^(a,b), Jiayi Li ^(b,c), Andrew King ^(d), Luc Robbiola ^(e), Mathieu Thoury ^(b), Christophe Moulh erat ^(f), Ariane Thomas ^(g), Pierre Gu eriau ^(b,d), Pierre Galtier ^(e), Monica Gulmini ^(a) & Lo ic Bertrand ^(b,d)

^(a) Universit  degli Studi di Torino, Dipartimento di Chimica, Via Giuria 5, 10124 Torino, Italy

^(b) IPANEMA, CNRS, MIC, UVSQ, Universit  Paris-Saclay, 91192 Gif-sur-Yvette, France

^(c) GEMaC, UMR 8635 CNRS, UVSQ, 45 Avenue des Etats-Unis, 78035 Versailles, France

^(d) Synchrotron SOLEIL, 91192 Gif-sur-Yvette, France

^(e) TRACES, CNRS, MIC, Universit  Toulouse - Jean Jaur s, 31100 Toulouse, France

^(f) Mus e du Quai Branly Jacques-Chirac, 37 quai Branly, 75007 Paris, France

^(g) D partement des Antiquit s Orientales, mus e du Louvre, pavillon Mollien, 75058 Paris, France

Corresponding author: bellato.marta@gmail.com

As most organic materials, textiles fibres are perishable in archaeological contexts. Nevertheless, in specific environments they may be preserved over millennia, for example in contact with metal objects. The corrosion of the metal support can enable an exceptional preservation of textile remnants in a process called “mineralisation” by archaeologists. The underlying physico-chemical mechanisms have been the subject of a very limited number of studies. An in-depth understanding of the causes and the conditions of this phenomenon, as well as of the variability of the involved processes, is yet to be achieved.

We report the study of mineralised linen fabrics identified at the surface of copper-based artefacts coming from Mesopotamia (Telloh and Susa sites, 5th–2nd millennium BC) and in the Indus areas (Nausharo site, 4th millennium BC; Gonur-depe site 3rd–2nd millennium BC), currently conserved and under study at the Louvre and the Quai Branly museums. In Mesopotamia, these finds are major direct testimony of textile manufacturing from the corresponding cultures, otherwise uniquely known from cuneiform texts.

2D and 3D synchrotron-based micro-imaging techniques were carried out to characterise in a non-destructive way these organic textile remnants in connection with the inorganic corrosion compounds. We performed and optimised synchrotron X-rays micro-computed tomography to identify and locate the distinct copper corrosion phases formed, on the basis of difference in their density. Preliminary tests using high-spatially resolved synchrotron UV/visible photoluminescence spectral imaging were performed to investigate the heterogeneity of individual mineralised bundles of fibres. We reveal the internal structure of these mineralised textile fibres in connection with the corrosion phenomena, and discussed the different mineralisation facies observed.

The present work illustrates the potential of 2D and 3D synchrotron micro-imagery to study mineralised textiles in association with metal objects.

We acknowledge support from LabEx PATRIMA / Fondation des sciences du patrimoine.

References

Bertrand L., Vichi A., Doucet J., Walter P. and Blanchard P., The fate of archaeological keratin fibers in a temperate burial context: Microtaphonomy study of hairs from Marie de Bretagne (15th c., Orl ans, France), *Journal of Archaeological Science*, 42 (2014) 487–499.

Chen H.L., Jakes K.A. and Foreman D.W., Preservation of archaeological textiles through fibre mineralization, *Journal of Archaeological Science*, 25, 10 (1998) 1015–1021.

Good I., Archaeological textiles: a review of current research, *Annual Review of Anthropology*, 30 (2001) 209–226.

Thomas A., Moulh erat C., Restes textiles sur un clou de fondation de Gudea.  tude pr liminaire, *Pal orient Journal*, 38, 1 (2015) 151–159.