

# The ArCo Project: Ageing Study of Treated Composite Archaeological Waterlogged Artefacts

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The ArCo project (2013 – 2015) has been recently approved for funding in the framework of JPI-JHEP Joint Pilot Transnational Call for Joint Research Projects on Cultural Heritage. The research will be carried out by 5 groups in 4 European Countries:



The Fourth sled as it appears today. The varnished surfaces mask the deteriorated wood inside – Oseberg collection

## AIM OF THE PROJECT

Many forms of deterioration on wooden treated objects are due to the presence of **unstable salts**, which may oxidize to cause swelling and cracking of wood and lead to a catastrophic acidification. This project proposes to investigate a preventive approach in order to choose the most suitable treatments to limit the oxidation of salts in archaeological wood.



The sulfurated "leprosy" on wood treated with PEG: Collection Villefranche/Sea Lomellina, Genoese wreck of the 16<sup>th</sup> century

UiO: Museum of Cultural History  
University of Oslo

ARC-nucleART

Natmus  
Museum I ét

ARCHA

DIPARTIMENTO DI CHIMICA  
E CHIMICA INDUSTRIALE  
University of Pisa

Museum of Cultural History,  
University of Oslo (KHM)

ARC-Nucléart of  
Grenoble (ARC)

National Museum of  
Denmark (Natmus)

ARCHA Laboratory of  
Pisa (ARCHA)

Department of  
Chemistry– University of  
Pisa (DCCI)

## ARTICULATION AND WORKPACKAGES

Samples are prepared in order to be as much **representative** as possible of wood degradation phenomena: acidification, formation of salts, drying, consolidation treatments (PEG, in situ radiopolymerization of a styrene-polyester resin, salts of fatty acids, bakelite, cellulose or chitosan).



A fragment considered one of the worst case of alum-treated wood from the Oseberg finds

WP1. Samples constitution  
(ARC, Natmus, KHM)

WP2. Artificial aging of  
consolidated samples and  
in-situ characterization  
(Natmus, ARC)

WP3. Characterization of  
materials before and after  
weathering treatments  
(DCCI, Natmus, ARCHA)

Treated samples are placed in **climatic chamber** and subjected to RH fluctuations while a camera records the development of salt spots on the surface of the material. Sorption isotherms are recorded too (DVS).



Climate chamber

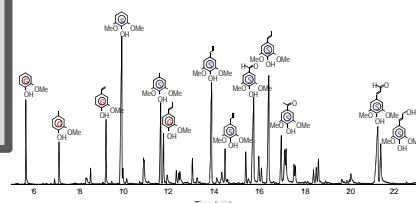
WP4. Results exploitation  
and dissemination  
(KHM, DCCI, Natmus, ARC,  
ARCHA)

- Py-GC/MS, DE/MS provides information on wood composition and organic consolidants at a molecular level;
- IC, GC/MS, HPLC-DAD and HPLC-ESI-Q-ToF characterize soluble extractives;
- ICP-OES, FTIR, SEM-EDX and XRF characterize inorganic salts.
- Microbiological investigation permits to monitor the growth of fungi and other microorganisms.

Conclusions about ageing study of the different systems consolidant/unstable salts will be established from the comparison between various available conservation treatments. Dissemination of the results towards the scientific community will be associated with establishment of related recommendations.



Py-GC/MS instrumentation



Py-GC/MS chromatogram of hardwood lignin