

Formation continue

GoGreen

Stabilization methods for archaeological metals & Cleaning methods for historical metals

17-18-19.11.2025

Trainers

Edith Joseph is a research scientist and professor at Haute Ecole Arc CR. She develops her research activities on green conservation and biotechnologies applied to cultural heritage. **Qing Wu** is a postdoctoral researcher involved in the GoGreen project - WP3, focusing on the biocleaning of historical metal objects. **Patrycja Petrasz** focuses her PhD research topic on the stabilization of archaeological iron and copper artefacts using waste product (yeast biomass). **Lidia Mathys** is an experienced technician supporting the practical work and the different practical aspects regarding the study of microbial processes. **Francesca Ramacciotti** is a postdoctoral researcher at the Chemistry Department of the University of Bologna. Her research mainly focuses on the development and testing of greener and less invasive cleaning systems for cultural heritage.

The course in brief

The Haute Ecole Arc Conservation-restoration, as part of the HES-SO network, is involved in a research project entitled GoGreen (*Green strategies to conserve the past and preserve the future of cultural heritage*). GoGreen promotes preventive and remedial conservation practices based on green principles to spearhead the green revolution within conservation.

Emphasis is placed on developing methods that are biodegradable, bio-sourced, easily accessible, simple to operate and safe for both conservators and the environment, while optimizing treatment performance.

The course is divided into two parts : cleaning and stabilization (It is possible to register for the whole course or just one of the two topics. The selection is made when filling in the registration form).

Go Green 1/2 - Stabilization methods for archaeological metals

Taking advantage of certain microbial metabolites (active substances from bacteria or fungi) and the benefits of recently developed delivery systems (gels) in the field of conservation, reactive corrosion products can be converted into more stable compounds and chlorides be removed from objects. Green solutions will be presented as an alternative to the traditional methods that are harmful to the environment and conservators. Then the participants will prepare and apply the product on test objects made of copper or iron. Participants are strongly encouraged to bring objects and samples for the practical sessions, i.e., copper/iron archaeological small items (i.e. nails...) free from soil deposits and without any previous restoration materials present (acrylic coatings for example).

Go Green 2/2 - Cleaning methods for historical metals

Taking advantage of certain microbial metabolites (active substances from bacteria or fungi) and the benefits of greener solvents and recently developed delivery systems (gels, electrospun tissues) in the field of conservation, tarnish layers or altered organic coatings can be removed from metal surfaces altered with time. Various green cleaning formulations will be presented, then prepared and applied by the participants on test objects made of copper, iron or silver. Participants are strongly encouraged to bring objects and samples for the practical sessions, i.e., copper/iron/silver, historical metals, with or without organic coatings to be removed.

Target audience

Conservator dealing with metallic artefacts.

Course

Day 1 (13.30-17.00) - Stabilization methods for archaeological metals

- Welcome of participants
- Theory
 - Presentation of proposed biological alternatives
- Practical session **Iron** (part A)
 - Preparation of hydrogels/immersion solutions amended with *Meyerozyma sp.* fungi (biosorption + iron reduction) for the extraction of chlorides and conversion of reactive iron corrosion products
 - Application on practical cases brought by participants

Day 2 (9.00-17.00) - Stabilization methods for archaeological metals

- Practical session **Copper**
 - Preparation of hydrogels amended with *Beauveria bassiana* fungi (biopassivation) for the conversion of reactive copper corrosion products
 - Application on practical cases brought by participants
 - Treatment end with *Beauveria bassiana* fungi (biopassivation) on copper coupons
- Practical session **Iron** (part B)
 - Treatment end with *Meyerozyma sp.* fungi (biosorption + iron reduction) for the extraction of chlorides and conversion of reactive iron corrosion products
- Feedback and discussion

Day 3 (8.30-17.00) - Cleaning methods for historical metals

- Theory
 - Presentation of proposed biological alternatives
 - Presentation of electrospun tissues
- Practical session
 - Preparation of hydrogels with bio-based active agents for the removal of tarnish layers on copper-, iron-, and silver-based substrates

- Preparation of electrospon tissues with bio-based active agents for removing tarnish/corrosion layers on copper-, and iron-based substrates
- Application on practical cases brought by participants
- Feedback and discussion, including perspectives on the removal of organic coatings on metals and one-two pouch formulations (removal of coatings + corrosion at the same time)

Cost

Free

Meals, accomodation and travel expenses at own charge of participants

Contact

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