Objectives of the B-IMPACT project:

- to develop protective coatings for outdoor bronzes with high performance in terms of durability, while respecting the ethics of the cultural heritage,
- to investigate the toxicity of the more efficient coatings with the aim of selecting non-hazardous ones, and
- to produce a marketable pre-formulation of the most efficient coatings

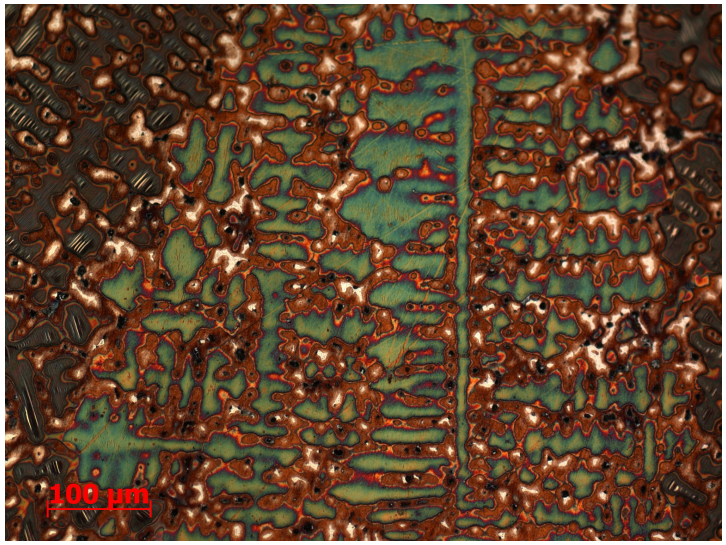
Workpackages of the B-IMPACT project:

WP0 - Coordination
WP1 - Production of representative substrates (patination)
WP2 - Coating Development
WP3 - Protective Treatments Toxicity Assessment
WP4 - Assessment of the protectiveness and suitability of candidate treatments
WP5 - Pre-industrialisation process and validation of coating application
WP6 - Dissemination and Utilization

IMPACT B

Bronze-IMproved non-hazardous PAtina CoaTings

The **B-IMPACT project** aims at developing innovative eco-friendly and non-hazardous protective coatings with specific properties tailored for improving the protection of outdoor bronzes.



Partners of the B-IMPACT project are from universities, research institutions and industry:

M-era.Net

- **Slovenian National Building and Civil Engineering Institute**, Slovenia (www.zag.si) - project coordinator
- **Geida d.o.o.**, Slovenia (www.geida.si/)
- Alma Mater Studiorum **University of Bologna**, Italy (www.unibo.it/)
- Corrosion and Metallurgy Study Centre "Aldo Daccò", **University of Ferrara**, Italy (www.unife.it/centri/centro/corrosione-en)
- **ECAMRICERT S.R.L.**, Italy (www.ecamricert.com)
- TRACES Laboratory – CNRS UMR 5608 – **Toulouse University**, France (traces.univ-tlse2.fr)
- **PYLOTE SAS**, France (www.pylote.fr)
- **C2M Aurochs Industrie**, France (http://c2m-aurochs-industrie.com)

b-impact@zag.si
www.b-impact.eu
www.facebook.com/b.impact.project

Production of representative substrates - patination:

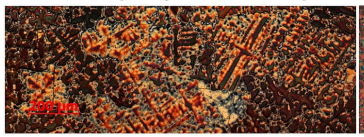
Simulation of two different situations for outdoor monuments:

- (1) Modern silicon bronze (CuSi), currently used by artistic foundries for contemporary art, finished by brown patina. Samples will be supplied in the artificially patinated condition.
- (2) Historical quaternary bronze (CuSnZnPb), covered by natural outdoor patinas. Samples will be patinated by accelerated ageing tests.

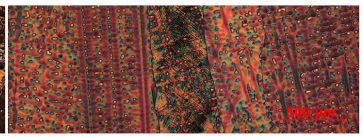
Compounds of modern bronze - Si and Mn

Bronze casting in Livartis art foundry

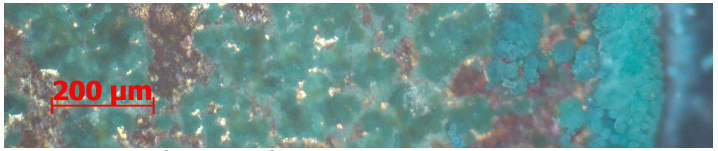
Metallographic images of ...



Historical CuSnZnPb



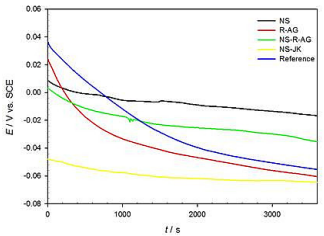
Modern CuSi



Green patina on bronze

Coating Development:

- (1) Fluoropolymers coatings with outdoor durability, chemical resistance and good flexibility.
- (2) Silane coatings with protectiveness towards patinated bronze. Their long term efficiency will be improved by addition of hybrid particles
- (3) Multi-layer coatings, consisting of different layers of oppositely charged non-toxic polyelectrolytes, applied by a modified Layer by Layer (LbL) method;
- (4) Spray sol-gel coatings for patinated bronze for easy application.



Example of corosion potential measurements of different coatings on patinated bronze in artificial acid rain

Protective Treatments Toxicity Assessment:

To estimate the toxicity level of:

(1) existing commercial coatings and their environmental footprint.

(2) newly developed bronze coatings at the concentration adopted for application.

Assessment of the protectiveness and suitability of candidate treatments:

- The most effective protective treatments will be applied to patinated and characterized bronzes.
- The assessment of the protectiveness of the selected treatments will be performed through accelerated artificial ageing tests.

Ljubljana city centre, Prešeren monument: Farewell of Črtomir and Bogomila from Baptism at the Savica (detail). Bogomila cries in the arms of the hero Črtomir.

Pre-industrialisation process and validation of coating application:

- preparation of coating at a preindustrial level;
- validation of the applicability onto outdoor bronze monuments;
- simple market testing and economic evaluation of the product;