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The Doge's Palace in Venice where the PANNA team have been testing the plasma torch. Uros Cernigoj © Shutterstock.com

# Plasma torch preserving history

## Researchers have developed a less damaging alternative to traditional cleaning methods for historic artefacts – the plasma torch.

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Plasma, an ionized gas rich in electrically charged particles, is able to chemically react with dirt or aged protective products on the surface of artwork, causing them to be blown away, while leaving the surface below untouched.

The researchers, from the EU-funded project 'Plasma and nano for new age soft conservation' – PANNA – are testing the plasma in combination with a diluted solution of an organic polymer, or traditional cleaning agent. The solution penetrates the black crust and helps the plasma to detach it from the surface of the stones.

It is part of a whole series of research projects funded by the EU that are looking at ways to help preserve Europe's cultural heritage. Heritage sites are important assets for European countries that can often earn millions of euros per year from tourists.

They're testing it on the black crust that coats some stone fragments from the Doge's Palace in Venice, Italy, that attracts hundreds of thousands of visitors each year.

At the Sveta Paraskeva church in Pleven, Bulgaria, researchers from PANNA compared a compressed air plasma torch to mechanical cleaning with a special type of sponge, and found that the plasma cleaned soot and candle wax from mural paintings just as well, or even better.

'We are removing thin layer by thin layer, gradually etching away the coating, and then using analysis techniques like infrared to see whether or not the coating is completely removed,' says Veerle Goossens of the Belgian company ChemStream, a partner in the PANNA project.

Researchers at PANNA had to develop a specialised plasma torch to clean historical artefacts, which they hope to commercialise when the project ends in October 2014.

Plasma torches are already used in industry to clean surfaces, but they can't be used for conservation because of unwanted side effects like the deposition of metallic particles from the electrodes of the torch, or an increase in the temperature of treated surfaces.

The new plasma torch is being tested on three types of surfaces: silver and bronze for the removal of oxides and sulphides, limestone and sandstone, and on mural paintings for dirt and previous protective coating removal. The tests are performed on both laboratory samples and real objects.

Plasma cleaning of Serena sandstone using a commercial plasma torch. © PANNA
Plasma cleaning of Serena sandstone using a commercial plasma torch. © PANNA

*Plasma cleaning of Serena sandstone using a commercial plasma torch. © PANNA*The plasma effects are also being tested on historical objects like orthodox icons, silver and sterling silver objects, marble and Istria stone for the removal of graffiti and aged polymers.

**A plasma coating**

The team is developing a new protective coating that can be applied to mural paintings, or other surfaces, using the plasma torch – and removed again at a later time if necessary.

The coating is hydrophobic, meaning water droplets actually bounce off the surface and create a self-cleaning effect that eliminates dirt and pollutants from the surface. However, at the same time, it allows pores to remain open to the air to avoid further damage.

The coating will also contain additives that enable its integrity to be monitored under ultraviolet light, and to prevent counterfeiting. After tests on lab samples on marble, limestone, sandstone, wall paintings, silver and copper, the coating will be applied to real artwork.

# More info

PANNA

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