

Chemistry

Layer of graphene could help protect statues and paintings from damage

Covering paintings with very thin layers of graphene, or mixing graphene-derived materials into mortars used for repairing historical structures, could protect them from degrading

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▲ **The Leshan Giant Buddha statue, carved into a cliff face**

John W Banagan/Lonely Planet Images/Getty Images

Graphene, an extremely thin material known for its excellent electrical conductivity, could also be a powerful tool for preserving paintings, statues and historical buildings.

Often called a “wonder material”, graphene consists of a single layer of carbon atoms and is highly resistant to heat, acids and physical damage. It also absorbs only about 2 per cent of visible light, making it mostly transparent – and a good candidate for shielding artwork. [Mauro Moglianetti](https://www.iit.it/people-details/-/people/mauro-moglianetti)  <https://www.iit.it/people-details/-/people/mauro-moglianetti> at the Italian Institute of Technology and his colleagues reviewed dozens of experiments that used graphene in this way.

“I was astonished by the number of possibilities,” he says.

In one notable experiment, [Costas Galiotis](https://www.iceht.forth.gr/en/people/galiotis-costas/)  <https://www.iceht.forth.gr/en/people/galiotis-costas/> at the University of Patras in Greece and his colleagues [created](https://www.nature.com/articles/s41565-021-00934-z)  <https://www.nature.com/articles/s41565-021-00934-z> metre-sized sheets of graphene and transferred them onto canvas, paper, cardboard and other materials. This shielded the materials against the degrading effects of UV light, oxygen and moisture.

“Besides testing on coloured mock-ups, we successfully deposited the transparent [graphene] membranes on real paintings and, after exposure to accelerated ageing tests, demonstrated that graphene indeed offered good protection against fading and discoloration,” says Galiotis. Unlike currently used [anti-fading varnishes and coatings](/article/2403289-why-so-many-prehistoric-monuments-were-painted-red/)  </article/2403289-why-so-many-prehistoric-monuments-were-painted-red/>, these graphene membranes are easy to remove, he says.

Other researchers focused on protecting metallic artefacts from corrosion by coating them with graphene or graphene-derived compounds, such as graphene oxide. These materials have also been added to mortars used for restoring historical buildings and statues.

[Yulan Hu](https://person.zju.edu.cn/en/huyulan)  <https://person.zju.edu.cn/en/huyulan> at Zhejiang University in China and her colleagues tested one such compound on replicas of the red sandstone that makes up the Leshan Giant Buddha, an enormous sculpture carved into a cliff face in Sichuan province, China. They created a spreadable mixture made from particles of copper and oxygen plus graphene oxide. They then brushed it on [samples](/article/2404382-construction-robot-builds-massive-stone-walls-on-its-own/)  </article/2404382-construction-robot-builds-massive-stone-walls-on-its-own/> covered in moss to mimic the damaging vegetation growing on the statue. After 30 days, the moss mostly dried out and stopped growing.

“The bar for actually putting graphene on artwork will be very high,” says team member [Camilla Coletti](https://www.iit.it/people-details/-/people/camilla-coletti)  <https://www.iit.it/people-details/-/people/camilla-coletti>, also at the

Italian Institute of Technology. She has spent many years thinking about the different properties and applications of graphene, but depositing it on the variously textured surfaces of different works of art without damaging them presents new technical challenges.

“I believe that mortars and other materials that contain graphene will [be used on statues and buildings] sooner. There are start-ups that could make them already,” she says.

Galiotis says the cost of such processes may be an issue. He and his team are currently working on developing graphene-based devices for detecting and capturing moisture and other compounds that can harm artwork – another use for the material.

“We think this is just the beginning, and graphene is here to stay,” says Moglianetti.