Fabricating Functional Circuits on 3D Freeform Surfaces

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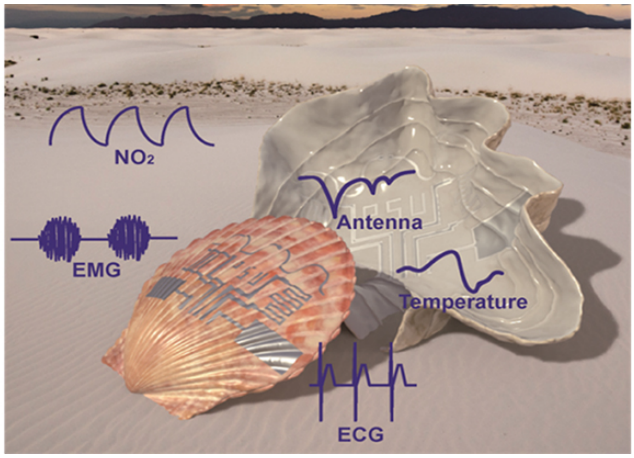

Circuit printed on seashell

Technology Summary

This technology presents a new fabrication strategy that can directly print functional circuits either transient or long-lasting onto freeform surfaces by intense pulsed light-induced mass transfer of zinc nanoparticles (Zn NPs). The intense pulsed light can locally raise the temperature of Zn NPs to cause evaporation. A conformal lamination of a kirigami-patterned soft semi-transparent polymer film with Zn NPs to a 3D surface results in condensation of Zn NPs to form conductive yet degradable Zn patterns onto a 3D freeform surface for constructing transient electronics. Immersing the Zn patterns into a copper sulfate or silver nitrate solution can further convert the transient device to a long-lasting device with copper or silver. Functional circuits with integrated sensors and a wireless communication component on 3D glass beakers and seashells with complex surface geometries demonstrate the viability of this manufacturing strategy.

Application & Market Utility

Deployment of functional circuits on a 3D freeform surface is of significant interest to wearable devices on curvilinear skin/tissue surfaces or smart Internet-of-Things with sensors on 3D objects. Yet, direct fabrication of circuits on 3D freeform surfaces has long been challenging due to the incompatibility of conventional circuit fabrication methods on non-flat surfaces. Therefore, it is of significance to develop a fabrication technique for electronic devices that require 3D shapes.

Next Steps

The research team seeks collaboration and licensing opportunities.

TECHNOLOGY READINESS LEVEL 4-7

Seeking

Licensing | Research

Keywords

- Intense pulsed light
- Zinc mass transport
- 3D freeform surfaces
- Functional circuits

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