Chameleons inspire new multicolor 3D-printing technology

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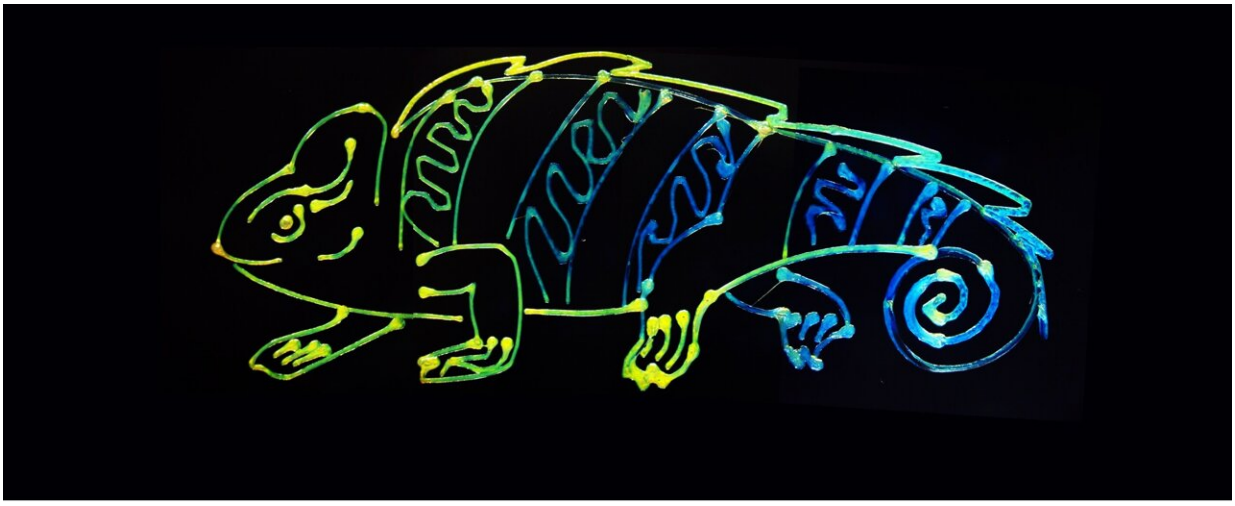

Inspired by the color-changing abilities of chameleons, researchers developed a dynamic and sustainable color-changing ink seen in this 3D printed chameleon illustration created by the research team. Credit: Sanghyun Jeon, Diao Lab.

Inspired by the color-changing ability of chameleons, researchers have developed a sustainable technique to 3D-print multiple, dynamic colors from a single ink.

"By designing new chemistries and printing processes, we can modulate structural color on the fly to produce color gradients not possible before," said Ying Diao, an associate professor of chemistry and

chemical and biomolecular engineering at the University of Illinois Urbana-Champaign and a researcher at the Beckman Institute for Advanced Science and Technology.

The study appears in the journal *PNAS*.

"This work is a great illustration of the power of collaboration," said co-author Damien Guironnet, an associate professor of chemical and biomolecular engineering.

In this study, Diao and her colleagues present a UV-assisted direct-ink-write 3D printing approach capable of altering structural color during the printing process by tuning light to control evaporative assembly of specially designed crosslinking polymers.

"Unlike traditional colors which come from chemical pigments or dyes that absorb light, the structural colors abundant in many biological systems come from nano-textured surfaces that interfere with visible light. This makes them more vibrant and potentially more sustainable," said Sanghyun Jeon, the lead author and a graduate student in the Diao Lab.

The researchers can produce structural colors in the visible wavelength spectrum from deep blue to orange. While an artist might use many different paints to achieve this color gradient, the research team uses a single ink and modifies how it is printed to create the color gradient.

"The work shows the benefit of us all having learned from each other by sharing our successes and challenges," said co-author Simon Rogers, an associate professor of chemical and biomolecular engineering.

"Only by working together could we design this system at the molecular level to yield such fascinating properties," said co-author Charles Sing,

an associate professor of chemical and biomolecular engineering and materials science and engineering.

More information: Sanghyun Jeon et al, Direct-ink-write cross-linkable bottlebrush block copolymers for on-the-fly control of structural color, *Proceedings of the National Academy of Sciences* (2024). DOI: 10.1073/pnas.2313617121. doi.org/10.1073/pnas.2313617121

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