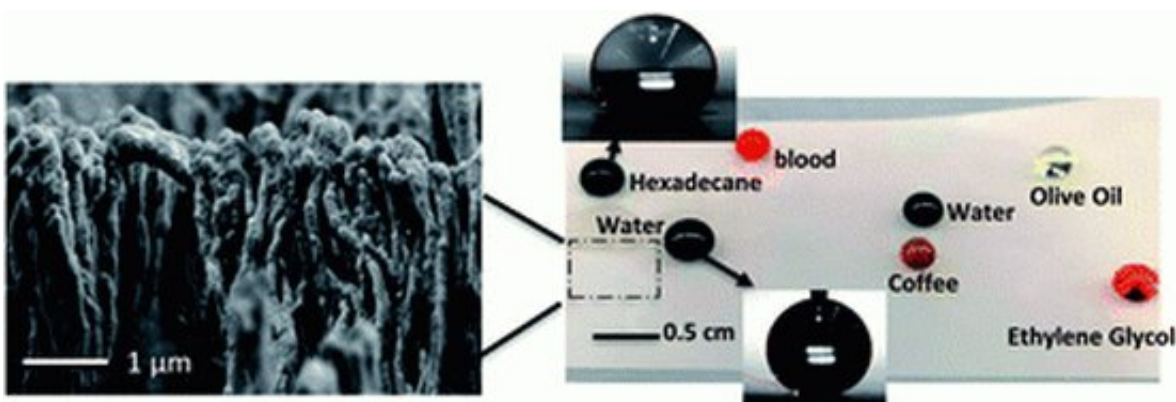


A forest of nano-mushroom structures keep this plastic clean and stain-free

June 19 2019



Credit: *Journal of Materials Chemistry A* (2019). DOI: 10.1039/C9TA01753D

Technologies like solar panels and LEDs require a cover material that repels water, dirt and oil while still letting plenty of light through. There is also interest in new flexible materials so these devices can be incorporated into a variety of creative applications like curtains, clothes, and paper. Researchers from the University of Pittsburgh's Swanson School of Engineering have created a flexible optical plastic that has all of those properties, finding inspiration in a surprising place: the shape of Enoki mushrooms.

The research, "Stain-Resistant, Superomniphobic Flexible Optical Plastics Based on Nano-Enoki Mushrooms," was published in the *Journal of Materials Chemistry A*.

The researchers created a plastic sheet surface with tall, thin nanostructures that have larger tops, like an Enoki mushroom. Named nano-enoki polyethylene terephthalate (PET), the nano-structures in the coating make the plastic sheet superomniphobic, repelling a wide range of liquids, while maintaining a high transparency. The surface can repel a variety of liquids such as not only water, but milk, ketchup, coffee, and olive oil. It also has high transparency and high haze, meaning it allows more light through, but that light is scattered. That makes it ideal for integrating with solar cells or LEDs, and combined with its flexible and durability, means it could be used in flexible lighting or wearable technology.

"The key thing with these structures is the shape—it keeps liquid on top of the nanostructure. This is the best in the literature so far in terms of high transparency, high haze and high oil contact angle," explains Sajad Haghanifar, lead author of the paper and doctoral candidate in industrial engineering at Pitt. "We show that substances that usually stain and leave residue behind, like mustard and blood, fall completely off the surface, even after they've dried." Videos show how the dried mustard and blood flake off the surface when the surface is tilted.

"The lotus leaf is nature's gold standard in terms of a liquid-repellant and self-cleaning [surface](#)," says Paul Leu, Ph.D., associate professor of [industrial engineering](#), whose lab conducted the research. Dr. Leu holds secondary appointments in mechanical engineering and materials science and chemical engineering. "We compared our nano-enoki PET with a [lotus leaf](#) and found that ours was better at repelling more kinds of liquids, including olive oil, blood, coffee, and ethylene glycol. The surfaces not only resist staining from various liquids, but may be adapted for medical applications to resist bacteria or blood clotting."

More information: Sajad Haghanifar et al, Stain-resistant, superomniphobic flexible optical plastics based on nano-enoki

mushroom-like structures, *Journal of Materials Chemistry A* (2019).
[DOI: 10.1039/C9TA01753D](https://doi.org/10.1039/C9TA01753D)

Provided by University of Pittsburgh

Citation: A forest of nano-mushroom structures keep this plastic clean and stain-free (2019, June 19) retrieved 27 April 2024 from <https://phys.org/news/2019-06-forest-nano-mushroom-plastic-stain-free.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.