

Biodegradable Sunflower Pollen Sponges Could Soak Up Oil Spills

[Luana Steffen](#) Apr 11, 2021



The pollen sponges. (Credit: NTU Singapore)

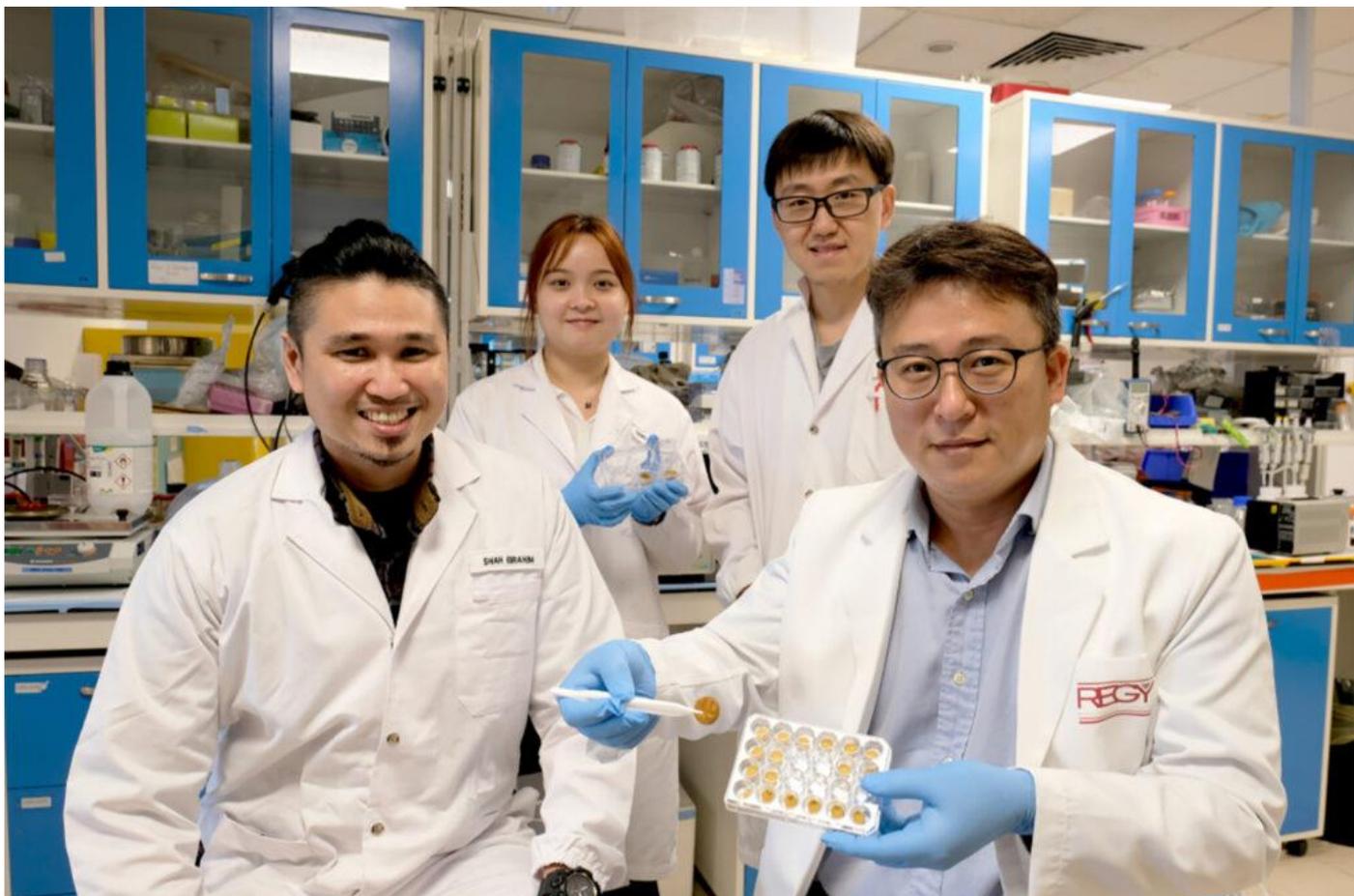
Last year, scientists at Singapore's Nanyang Technological University (NTU) turned pollen – one of the plant kingdoms' most rigid materials – into flexible, [eco-friendly soft gel particles](#). Recently, a team from NTU and South Korea's Sungkyunkwan University used those particles to create [sponges that could absorb oil spills](#), then biodegrade once it has served its purpose. The team describes the gel-making process as being similar to soap production.

First, the scientists collected pollen grains from sunflowers coated with a naturally occurring sticky oil-based cement. Those grains were then incubated in alkaline conditions for three days to remove the cement, leaving a gel-like interior substance behind.

That gel was freeze-dried to create a three-dimensional spongy material, which was then heated to 392°F (200°C) to stabilize it. Finally, the team coated the spongy material with a stearic acid layer, a saturated fatty acid found in numerous animal and vegetable fats.

While the resulting sponges each have a diameter of 2 in (5 cm), they could still be made considerably larger for commercial applications. They are incredibly porous, and the addition of the stearic acid also makes them hydrophobic, which means they repel water. That way, when the sponges are in oil-polluted water, they absorb only the oil – they don't become soaked and mushy with water.

In lab tests involving several kinds of solvents and oils, the sponges displayed an absorption capacity comparable to that of commercially available polypropylene absorbents. However, unlike those petroleum-derived materials, the pollen sponges are made from renewable matter that breaks down once discarded. Each sponge can be squeezed out and reused at least ten times before throwing it away. The team published their findings on March 12, 2021, in the journal [Advanced Functional Materials](#).



The research team's main members, from right to left: NTU Prof. Cho Nam-Joon, NTU research fellow Dr. Zhao Ze, NTU Masters student Deng Jingyu, and NTU Ph.D. student Mohammed Shahrudin Ibrahim. (Credit: NTU Singapore)

Lead scientist Cho Nam-Joon, an NTU Professor, said:

By fine-tuning the material properties of pollen, our team successfully developed a sponge that can selectively target oil in contaminated water sources and absorb it. Using a material that is found abundantly in nature also makes the sponge affordable, biodegradable, and eco-friendly.

Hair is also an ideal natural alternative to traditional dispersants used to fight oil spills. In 2019, a barbershop chain in Sydney began collecting all the clients' cut hair, then donated it to institutions that make [stuffed stockings used to absorb oil](#) during oil spills.