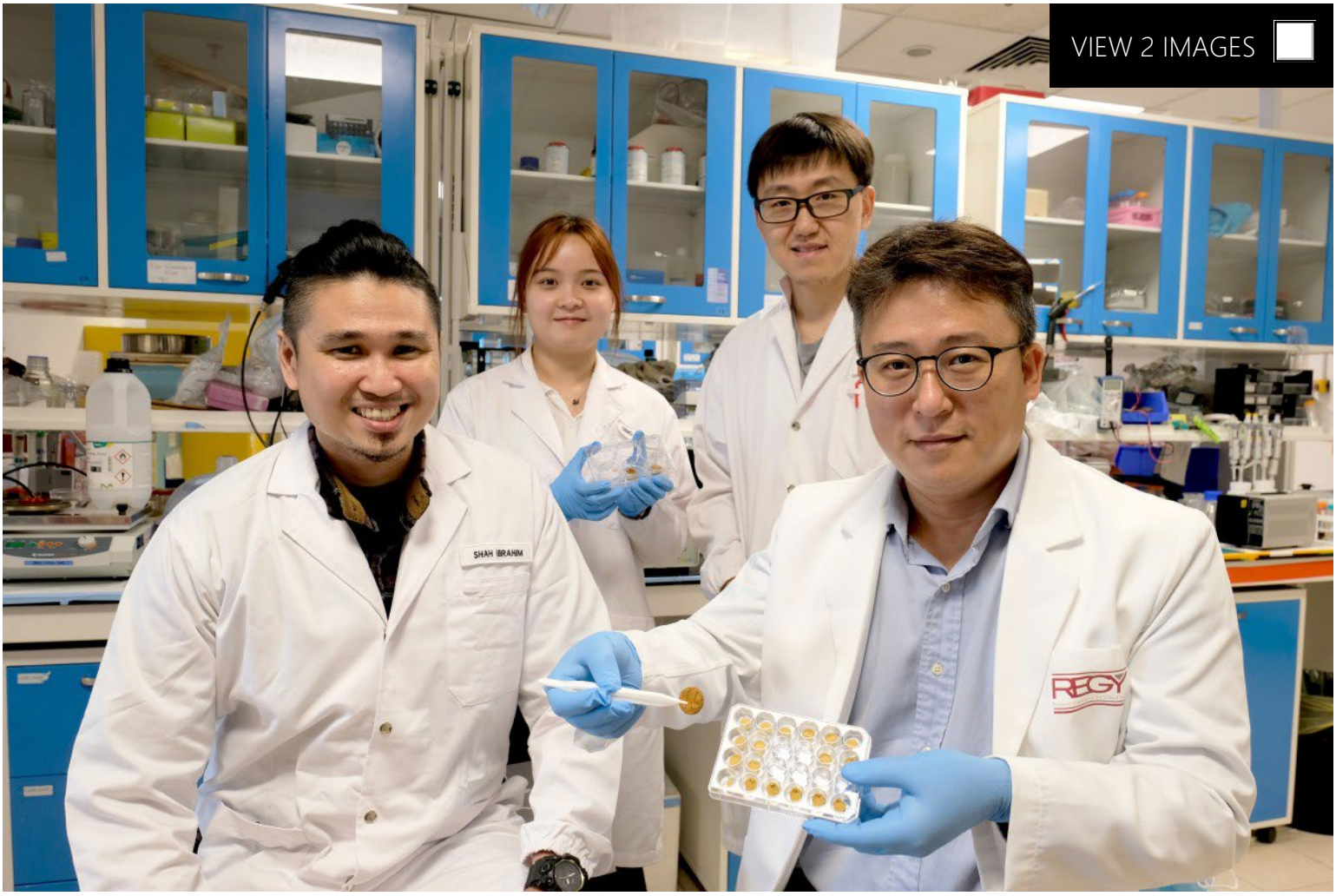
NEW ATLAS

VIRONMENT

Biodegradable plant-pollen sponges could soak up oil spills

By Ben Coxworth
April 07, 2021



Key members of the research team, from left to right: NTU PhD student Mohammed Shahrudin Ibrahim, NTU Masters student Deng Jingyu, NTU research fellow Dr. Zhao Ze, and NTU Prof. Cho Nam-Joon NTU Singapore

Last year, we heard how scientists had created eco-friendly soft gel particles from hard grains of pollen. Now, they've used those particles to create sponges that could soak up oil spills, then biodegrade once used up.

Developed by a team from Singapore's Nanyang Technological University (NTU) and South Korea's Sungkyunkwan University, the gel-making process is described as being similar to the production of soap.

The scientists started with pollen grains from sunflowers, which were already covered with a naturally occurring sticky oil-based cement. That cement was removed by incubating the grains in alkaline conditions for three days, leaving their gel-like interior substance behind.

That gel was then freeze-dried to form a three-dimensional spongey material, which was subsequently heated to 200 ºC (392 ºF) in order to stabilize it. Finally, the material was coated with a layer of stearic acid, which is a fatty acid found in vegetable and animal fat.

A batch of the pollen sponges NTU Singapore

The resulting sponges each have a diameter of 5 cm (2 in), although they could be made much larger for commercial applications. They're very porous, but the addition of the stearic acid also makes them hydrophobic, meaning that they repel water. Therefore, if placed in oil-polluted water, they soak up only the oil – they don't become saturated with water.

In lab tests involving various types of oils and solvents, the sponges were found to have an absorption capacity similar to that of commercially available polypropylene absorbents. Unlike those petroleum-based products, however, the pollen sponges are made from renewable materials that biodegrade once discarded – speaking of which, each sponge can be wrung out and reused at least 10 times before needing to be replaced.

"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," says the lead scientist, NTU's Prof. Cho Nam-Joon. "Using a material that is found abundantly in nature also makes the sponge affordable, biodegradable, and eco-friendly."

The research is described in a paper that was recently published in the journal *Advanced Functional Materials*.

Source: Nanyang Technological University

TAGS

ENVIRONMENT NANYANG TECHNOLOGICAL UNIVERSITY OIL

HYDROPHOBIC BIODEGRADABLE

Ben Coxworth

Based out of Edmonton, Canada, Ben Coxworth has been writing for New Atlas since 2009 and is presently Managing Editor for North America. An experienced freelance writer, he previously obtained an English BA from the University of Saskatchewan, then spent over 20 years working in various markets as a television reporter, producer and news videographer. Ben is particularly interested in scientific innovation, human-powered transportation, and the marine environment.