

# New eco-friendly self-cleaning material tough on stains, light on effort

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To create easy-to-clean surfaces, scientists have developed coatings for use on an array of materials, including fabrics, glass, concrete and windshields. Credit: Aldridged, Dreamstime.com

Cleaning oily smears from kitchen countertops, mirrors, garage floors, and other surfaces with plain water — rather than strong detergents or smelly solvents — may seem like pure fantasy. But scientists in Indiana today describe what they believe to be a simple and effective state-of-the-art oil stain remover. They have developed a new coating for glass, plastics, and a range of other materials that would enable consumers to wipe away those pesky oils with plain water.

Their report at the 238th National Meeting of the American Chemical Society (ACS) points out that the same coatings can be added to common window cleaning sprays and used to prevent bathroom mirrors, automobile windshields and other surfaces from fogging up.

"You add water, and the [oil](#) just comes right off like magic," said Jeffrey Youngblood, Ph.D., lead researcher on the project. "These are eco-friendly coatings — environmentally 'green' in the sense that they eliminate the need for harsh detergents and solvents in settings ranging from home kitchens to industrial machine shops that must contend with heavy oil spills."

The materials could be used in a range of consumer and industrial products, Youngblood said. They include household cleaners, easy-to-clean paints, water filters that separate water from oil, sealants for [concrete](#) floors and walls that repel oil in home garages and auto repair shops. In addition, anti-fog coatings could be used on windshields or eyewear, including everyday lenses and fog-free scuba masks.

The eco-friendly plastics could reduce the need for detergents containing phosphates. "We put out tons of detergents and phosphates each year," said Youngblood, adding that the polymer materials also could reduce the use of detergents for laundering clothes. This would cut down on the release of phosphates, which wash into lakes and streams and stimulate growth of algae, depleting oxygen supplies in ways that cause fish kills in waterways and make swimming unsafe for humans.

"The idea is to use these polymers to clean in situations where it's inconvenient to apply soap or anywhere you would need to have oil cleaned off easily," said Youngblood, a materials engineer at Purdue University in West Lafayette, Ind. "Oil fouling is always a problem. A lot of people overlook the fact that pure water will generally not remove oil from a surface, but using this product transforms water into a super

detergent."

Youngblood's group spent years in an effort to develop substances with the goal of making a surface that would repel oil more than water. Once successful, their framework for self-cleaning plastics was in place. "With these materials, if you stuck an oil droplet on them you could completely remove it with water. You could basically do soap-free rinsing."

These [polymer](#) coatings — about 20,000 times thinner than the width of a human hair — were highly sensitive to water and would break to the touch. Youngblood has built upon these materials to make a new family of ready-to-use polymers that can be easily applied to a variety of surfaces.

They have a bottom layer of polyethylene glycol, which attracts water, and an upper layer of a Teflon-like molecule that prevents the passage of oil. The result is a surface that holds a film of [water](#) while repelling oil. "Our work is a big step forward toward useable materials as either additives or coatings," he said, "and few others are working in this area. Most research on self-cleaning is done with different surfaces."

Youngblood is currently evaluating self-cleaning and anti-fog capabilities for polymers on different kinds of metals and ceramics. Preliminary tests on the lifetime of anti-fog coatings are especially encouraging. "We have stored these on shelves and use it months afterwards, and we haven't noticed a decrease in performance," he said. "We feel that we can make all our self-cleaning plastics commercially available within a few years."

Source: American Chemical Society ([news](#) : [web](#))

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