

Smog-Busting Roof Tiles Could Clean Tons of Pollution

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By [Tony Barboza](#) Staff Writer

UC Riverside researchers say they have demonstrated an inexpensive roof coating that gobbles up smog-forming pollutants and, if widely adopted, could clean tons of air pollution from Southern California each day.

In a laboratory experiment, engineering students found that ordinary clay roof tiles sprayed with titanium dioxide removed 88% to 97% of nitrogen oxide pollution from the air.

A laboratory experiment found that the two tiles on the left, coated with a titanium dioxide mixture, removed up to 97% of nitrogen dioxide pollution from the air. At right, uncoated tiles. At top, a commercially available tile with titanium dioxide. (UC Riverside)

Nitrogen oxides, gases generated by fuel combustion and emitted from vehicle exhaust pipes, industrial stacks and power plants, react in sunlight to form ozone, the main ingredient of smog. But titanium dioxide, a chalky white compound, breaks down those pollutants into less harmful compounds.

The researchers calculated that if 1 million roofs were sprayed with the smog-eating compound they could remove 21 tons of nitrogen oxides from the air each day. That's about 4% of the roughly 500 tons of nitrogen oxides emitted a day in California's South Coast air basin, the nation's smoggiest region that includes heavily populated areas of Los Angeles, Orange, Riverside and San Bernardino counties.

"By removing one of the components from the reaction that produces ozone or smog, we can have some impact on improving air quality," said Kawai Tam, a lecturer in UC Riverside's Department of Chemical and Environmental Engineering who helped oversee the research project completed earlier this year by undergraduate students.

The results are encouraging, Tam said, because they show even a light coating of titanium dioxide can be effective. It would take only about \$5 worth of the compound to treat the existing roof tiles of an average-sized home, she said.

The research is not the first to quantify the air-purifying abilities of titanium dioxide, a compound that is commonly found in paint, sunscreen, makeup and other consumer products.

[A study](#) published last year, for instance, found that a city street in the Netherlands outfitted with titanium dioxide-coated paving blocks reduced nitrogen oxide air pollution by up to 45%.

While titanium dioxide roofing tiles are already available commercially, Tam said, they are expensive and few studies have examined how effective they are at curbing pollution.

In the UC Riverside experiment, researchers placed titanium dioxide-coated roof tiles inside a miniature atmospheric chamber they built from wood, Teflon and PVC pipes. They pumped the chamber full of nitrogen oxides and illuminated it with ultraviolet light to simulate sunlight. They then measured pollution concentrations to find that they plummeted over about a 20-minute period.

The next step, Tam said, could be to test how the smog-cutting coating performs in the real world and whether it can be produced in a variety of colors suitable for application on homes.

The researchers would also like to study whether adding titanium dioxide to paint and splashing it on walls, concrete and dividers along major highways would cut air pollution from traffic.
