

MATERIALS

High-tech lens treatment could render glasses permanently fog-free

By Ben Coxworth
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Shown here on an eyeglass lens, the thin film could also be applied to camera lenses Nanyang Technological University

Nobody likes fogged-up glasses or goggles, and unfortunately most anti-fog solutions need to be frequently reapplied. A new treatment, however, could make polycarbonate lenses permanently fog-free ... and self-cleaning, to boot.

Developed at Singapore's Nanyang Technological University, the process begins with the lens (or other plastic surface) being treated with oxygen plasma. This is done both to clean

it, and to improve the adhesion of a thin film which will subsequently be deposited onto it.

That transparent film is made up of two layers – one consisting of silicon dioxide, the other of titanium dioxide – and it's placed on the plastic via a [pulsed laser deposition](#) process. The latter involves using a laser to vaporize each of the two layer materials within a vacuum chamber. As the vaporized silicon dioxide and titanium dioxide rise upwards, they're finely deposited on the plastic substrate, which is located at the top of the chamber.

As is the case with other anti-fog coatings, this one works by causing tiny water droplets – which settle on the lens – to spread out into a uniform film which is easily seen through. It does so within just 93 milliseconds of a droplet touching the film.



An untreated piece of plastic fogs up when placed over hot water (left), while a treated sample resists fogging Nanyang Technological University

Tests also showed that the film resisted abrasion when rubbed with a cheese cloth pad (a standard abrasion-resistance testing technique), plus it remained bonded to the plastic when adhesive cellophane tape was applied to it and then peeled away. And as an added bonus, when the treated plastic is exposed to sunlight (or another ultraviolet light source), the titanium dioxide is triggered to break down organic contaminants such as dirt particles and bacteria.

"The reported results prove the multi-functionality of our coating," said PhD Student Sun Ye, first author of the study. "It is antireflective, anti-fogging, and self-cleaning. Additionally, the fabrication approach is fast and easy to implement with great durability. This makes our innovation unique among other anti-fogging methods which tend to end up with coatings with limited functions."

Source: [Nanyang Technological University](#)