Fogged glasses problem wiped out with ‘self-cleaning’ plastic coating

By E&T editorial staff

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A new type of coating has been developed that prevents plastic surfaces from fogging and also has a self-cleaning effect.

Created by scientists at Nanyang Technological University (NTU) in Singapore, the durable coating is made from a thin double-layered silicon dioxide and titanium dioxide film.

Anti-fogging sprays and wipes are popular products among spectacle or eyeglass wearers, especially since mask-wearing became a widespread practice during the Covid-19 pandemic. Anti-fogging coatings are also used in solar panels, windshields and displays or lenses that are used in humid environments.

However, current solutions in the market, such as anti-fogging sprays and wipes, are only temporary as they cannot withstand washing and must be reapplied regularly. In addition, they are prone to surface contamination by dirt or bacteria, which means replacement or maintenance is necessary.

Co-principal investigator of the study, Professor Chen Zhong of the NTU School of Materials Science and Engineering (MSE) said, “Most anti-fogging solutions today are temporary and have limited efficacy. Our team has demonstrated an approach that is fast to fabricate, taking around an hour, and produces long-lasting results, proving its potential for wide-ranging practical applications.”

The coating is applied through a two-step technique. Firstly, the plastic surface is treated with oxygen plasma, which is a common industrial method to clean surfaces to improve adhesion.

Then the thin double-layered film is deposited on the plastic surface using pulse laser deposition, in which a laser beam is focused to vaporise material from the intended coating target to achieve the desired level of thickness of the film.

The coating showed excellent adherence to the plastic surface. When subjected to abrasion using a cheesecloth pad – a standard test for optical coating - and an adhesion test using cellophane tapes, the coating maintained good durability.

Titanium dioxide, one of the chemicals used in the coating, has photocatalytic ability, meaning it can ‘self-clean’ by reacting with and removing organic residues under sunlight (ultraviolet light) exposure.

In lab tests, the newly developed coating was able to break down contaminants such as bacteria and dirt on the plastic surface after a full day of ultraviolet light exposure.

Co-lead researcher, professor Rajdeep Singh Rawat, said: “Our innovation is promising for use in industrial applications of various optical components; for example, on surveillance camera protective covers.

“The ability for the coating to ‘self-clean’ makes it a low-maintenance and trouble-free solution since the cover may be less obscured by surface dirt and grime, providing a clearer view for surveillance.”

The newly developed coating is also anti-reflective with a superior visible light transmittance of up to 89 per cent on a regular plastic lens, about 5 per cent better than the same lens without a coating.

This is particularly useful for eyeglasses, as higher visible light transmittance allows for more light to travel through the plastic and reach the eye, enabling greater clarity of vision.