

Two-Dimensional Anti-Scratch Coating on Large-Area Glass Surfaces

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ABSTRACT

The present disclosure generally pertains to thin film coating technologies. In particular, the present disclosure pertains to coating large area glass surfaces with two-dimensional materials to improve the scratch resistance and mechanical durability of the glass substrate while retaining transparency. The present disclosure results in surface-protected 10 large-area glass substrates that can be employed in high-precision optical, architectural, and aerospace applications.

KEY APPLICATION AREAS

1. **Anti-scratch glass protection:** Enhancing scratch resistance and mechanical durability of transparent glass surfaces.
2. **Optical applications:** Protection of high-precision optical glass while maintaining optical transparency.
3. **Display and touchscreen protection:** Durable, transparent surface coating for display panels and touchscreens.
4. **Automotive glazing:** Improving scratch and wear resistance of windscreens and automotive glass.
5. **Aerospace glazing:** Surface protection for aircraft canopies and cockpit windows.
6. **Architectural glazing:** Protection of large-area glass used in facades, skylights, and other architectural structures.
7. **Advanced functional glass:** Integration of WS_2 -coated glass into smart windows, transparent heaters, and multifunctional glazing systems.

POTENTIAL USE

1. Protective coating for display panels and touchscreens requiring high wear resistance and optical clarity.
2. Scratch-resistant architectural glass for facades, skylights, floors, and large-area glazing.

3. Automotive windscreens and windows requiring improved resistance to scratching and surface wear.
4. Aerospace windows, canopies, and cockpit glass requiring durability with retained transparency.
5. High-precision optical components where surface protection must not significantly affect optical performance.
6. Large-area glass surfaces requiring uniform, conformal anti-scratch coating.
7. Transparent functional glass for smart windows and transparent heating applications.
8. Glass integrated with electronic/photonics systems where mechanical durability and transparency are important.
9. Multifunctional glazing systems incorporating UV protection, EMI shielding, solar control, or infrared reflection through additional functional layers.
10. Durable low-friction glass surfaces for applications exposed to repeated sliding, contact, or abrasive interactions