

# Water-based self-cleaning coating film photovoltaic panel

Can hydrophobic sol-gel based coating be used in photovoltaic system?

This study proposes the development and application of hydrophobic sol-gel based coating in the photovoltaic system. The aims include synthesizing a hydrophobic sol-gel based self-cleaning coating for solar panel and characterizing the hydrophobic sol-gel based self-cleaning coating.

What is a self-cleaning photovoltaic (PV) panel?

Self-cleaning photovoltaic (PV) panel. 2211-3398/2022 Elsevier Ltd. All rights reserved. Dust is a small dry solid particle in the air that is emerged from natural forces (wind, volcanic eruption, and chemical) or man-made processes (crushing, grinding, milling, drilling, demolition, etc.) with its diameter ranging from 1 to 100  $\mu\text{m}$ .

Why do PV panels need a self-cleaning coating?

With the progressive development in nanotechnology, the demands on self-cleaning coating increasing among the PV panel industry. The end-users look forward to the flexible coating that has an easy spray-fabrication technique besides saving energy and time and applicable on any glass scale.

Does a self-cleaning coating reduce dust accumulation on PV panels?

In this study, a self-cleaning coating is focused on PV application mainly to reduce dust accumulation on PV panels. Hydrophobic coatings provide a variety of conveniences including a reduction in maintenance cost, the extermination of dreary manual work as well as minimizing time spent on cleaning.

Which nanomaterial can be used for self-cleaning coating on solar PV panels?

Apart from  $\text{SiO}_2$  nanomaterial, titanium dioxide ( $\text{TiO}_2$ ) is another well-known nanomaterial that can be used for self-cleaning coating on solar PV panels as it possesses both hydrophilic and photocatalysis properties. The developed  $\text{TiO}_2$ /silane coating possesses the WCA below  $10^\circ$ .

Why do photovoltaic panels need a transparent coating?

When sunlight shines on the photovoltaic panel, part of the visible light will be reflected, and the rest will be converted and utilized. Therefore, the transparency and anti-reflection of the self-cleaning coatings applied on photovoltaic modules cannot be ignored.

Another factor causing the decrease in the efficiency of PV panels is soiling. Materials that soil panels are dust, organic waste, water droplets, and snow, depending on ...

Self-cleaning coatings are essential for maintaining the efficiency of PV panels, with solutions broadly categorized into hydrophobic and hydrophilic types based on their interaction with ...

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The water droplets also exhibited a high water contact angle of  $157.9^\circ$  resulting in superhydrophobic antireflective coatings for solar panel. 44 Another study using Zr-O-Si ...

Surfaces that simultaneously exhibit hydrophobicity, high contact angle, and high transmission of visible light are of interest for many applications such as optical devices, photovoltaic (PV) panels, and self-cleaning windows. ...

This review article focuses on the recent development of transparent self-cleaning coating based on the glass panel application especially for the photovoltaic (PV) panel ...

Experiments under the actual working conditions of PV panels also show that the coating is indeed self-cleaning, which can improve the efficiency of the PV panels and lower the temperature of the PV panels, thus ...

Dust accumulation on photovoltaic (PV) panels in arid regions diminishes solar energy absorption and panel efficiency. In this study, the effectiveness of a self-cleaning nano-coating thin film is ...

Centeno et al. developed photonic front-coatings to improve the output efficiency of thin-film solar cells due to the self-cleaning property. The coating was developed by structuring parylene-C transparent encapsulants ...

Self-cleaning materials including super-hydrophobic and super-hydrophilic coatings have been applied for solar PV panels due to their surface wettability and surface micro-structure [11,12,13,14]. Piliouguine et al. [ 15 ] ...

Transparent self-cleaning coatings have garnered significant attention for their promising prospects in outdoor applications, particularly in solar panels and high-end optical devices. ...

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