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Fabrication of antireflection and anti-soiling coatings for desert based solar panels

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This research paper focuses on the fabrication of antireflection and anti-soiling polymer composite by means of spray coating, which can be applied for solar panels. Due to the frequent sandstorms within the region dust accumulates on the panels reducing their efficiency in the absorption of solar radiation and because of scarcity of water sources in the Middle East in general the frequent cleaning consumes a lot of money and water. The objective is to fabricate and develop a coating for solar panels with anti-soiling and anti-reflection characteristics. The composite material chosen is the mineral material halloysite nanotube (HNTs). HNTs are chemically non-toxic and can be found in large amounts at low prices. The proposed method involves spray coating a polymer composite followed by plasma etching the surface to generate the necessary roughness. The first step is to etch the surface by exposing the samples to varying types of plasma with certain condition, varying time and concentration to obtain a rough surface and to make the etched surface suitable for the air refractive index. The second step is functionalization of the etched surface by CF_4 plasma surface treatment. The Scanning Electron Microscope image shows how the different types of etching can affect the surface roughness, how HNTs are exposed to enhance the light transmission and to reduce/increase the wettability between the surface and the contact angle to achieve anti-reflection and self-cleaning properties. Optical and surface properties are further studied using spectroscopy and goniometer testing. From the results the optimum HNT concentration is 20 wt% and the optimum etching conditions are etching with CF_4 gas at 2 Pa and high power for 10 minutes. Finally, the spray coating can be developed with multi-characterization, long stability and low-cost coating that can easily be scaled up and applied onto current solar cells.

Biography

Nujood Saeed Ali AlShehhi is currently pursuing her Master's graduation in Khalifa University (Masdar Institute branch) and working on her Master's degree in Materials Science and Engineering. Her research focus is on developing a polymer coating material with anti-reflective and anti-soiling properties as part of the project of a super coating.

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