Transparent Superhydrophobic Coating Using Nanoparticle Embedded Teflon

Shah, Hetvi (School: Little Rock Central High School)

The accumulation of dust and dirt on solar panels can reduce its efficiency up to 20%, as particles block the solar energy from passing through. To work towards this, this research tailored glass to be superhydrophobic, allowing water to roll off the surface, taking the dust and dirt along, and transparent, allowing the sunlight to pass through. Superhydrophobic surfaces have high roughness and low energies, with a water contact angle (WCA) greater than or equal to 150˚. Thus, this research hypothesized that if the surface roughness is increased with Indium Tin Oxide (ITO)-AF2400 coatings, then the sample will be transparent and WCA will increase. To make the AF-2400 solution, AF-2400 and Fluorinert FC-40 were mixed together. Then, 200 µm of the Teflon solution was added to optically transparent ITO nanoparticles to create five solutions of different concentrations (mg/mL): 0, 5, 10, 15, and 20. These solutions were spin coated onto glass, increasing the surface roughness and, consequently, reducing the surface energy. The WCA, transparency, and surface roughness were measured using the Kruss Drop Shape Analyzer, UV-Vis Spectrophotometer, and Atomic Force Microscopy respectively. In conclusion, as the concentration increased, the WCA increased, the transparency decreased for each wavelength, and the roughness increased. The 15 mg/mL sample provided desired results: the average WCA was 150.1˚, the average transparency was around 92.46% in visible light, and the average roughness was 16.9 nm. Upon further investigation, this coating could be applied, alongside a mechanism, to release water to clean the solar panels.