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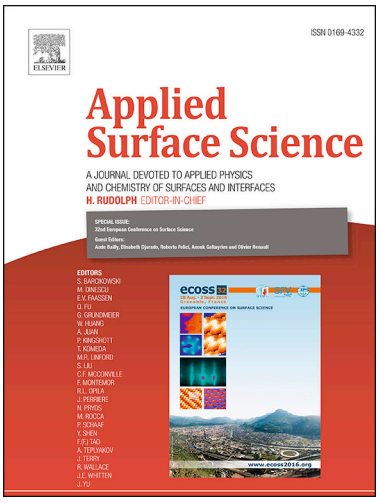

Full Length Article

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Durable superhydrophobic surface with highly antireflective and self-cleaning properties for the glass covers of solar cells

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Abstract: In this study, a superhydrophobic surface coating with highly antireflective properties that maintains a high durability and light transmittance was synthesized for possible use on the glass covers of solar cells. The coating was made in two steps to form a dual-scale structure. First, a 3D crosslinked network of nanopores was formed from the volatilization of pore-forming agents during calcination. Second, silica nanoparticles in a sol were attached to the nanopore structure, thereby reducing the size of the pore structures and forming a dual-scale structure. The refractive index of the coating was reduced to 1.3471, making the surface antireflective. The coated surface possessed an average transmittance as high as 97%, in contrast to the transmittance of 90% of the bare glass substrate. Meanwhile, the surface was superhydrophobic, showing a static water contact angle of 157.9° and a contact angle hysteresis of 1.2°. As a result, the as-prepared superhydrophobic coating showed outstanding self-cleaning properties. Moreover, the surface showed remarkable stability against strong acid, strong alkali and the impact of water drops. Further, the surface passed a 4H pencil hardness test. This facile and low-cost production method is believed to offer an effective solution for industrial applications in solar cells and windows, among others.