Investigation of particle aggregation and film coverage of hydrophobic-silica paticles for self-cleaning application

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Surfaces with superhydrophobic properties have attracted great interest in the scientific community for decades. Currently, water-proof properties have been applied to the surface of solar panels. Superhydrophobic surfaces were fabricated by chemical modification using hydrophobic functional groups. In addition, etching methods have been used to implement superhydrophobic properties by controlling the surface roughness. Topochemical technology has been various limitations to apply industrial field due to the poor economics of the post-treatment.
In this study, silica nanoparticles with 10 nm were synthesized via sol-gel process by adjusting the concentration of tetraethyl orthosilicate and ammonium hydroxide. Furthermore, hydrophobic silica powder modified with organosilane was obtained after washing in ethanol. The hydrophobic silica powder was dispersed in an alcohol-type solvent and coated on various substrates with a brush such as PET and Glass. Finally, superhydrophobic silica films were perfectly fabricated with a high contact angle of 150° and a low sliding angle of 10° based on the aggregation of silica particles in a diverse solvent.