4th International Conference on

Polymer Chemistry

June 25-27, 2018 | Stockholm, Sweden

Preparation of superhydrophobic and antibacterial fabrics through biomimetic lotus effect

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Superhyrodrophobic textiles were prepared through a biomimetic method of the lotus effect. It has been known that physical roughness and chemical hydrophobicity were essential to attain the lotus effect on textiles. Two different routes were applied for reproducing lotus effect on textiles. Firstly, physical roughness was controlled by adopting silica nanoparticles on the surface of textiles as well as chemical hydrophobicity was added by treating the surfaces with a commercial water-repellent agent. Narrow-size distributed silica nanoparticles were prepared by a sol-gel process. The water contact angle of the textiles treated with both silica nanoparticles and water-repellent agent reached up to 158°, which was much higher than 137° reached by the water-repellent agent only. For the immobilization of silica nano-particles and hydrophobic surface, a novel one-step process was investigated by synthesizing silica particles having hydrophobic vinyl groups and immobilization the silica with as UV irradiation. Secondly, a non-solvent induced phase separation method was applied for obtaining physical roughness on textiles. For the method, hydrophobic poly(vinylidene fluoride) (PVDF) and inorganic nanoparticles were selected. The effects of coagulating medium and temperature on microstructural morphology and surface hydrophobictity of the textiles were investigated. Superhydrophobic fabrics exhibiting water contact angle higher than 150° could be obtained by coating the fabrics with hybrid solutions of PVDF and ZnO nanoparticles followed by coagulation in ethanol as non-solvent. Moreover, antibacterial properties could be simultaneously obtained by utilizing photocatalytic effect of ZnO nanoparticles.

Biography

Byung Gil Min has completed his PhD from Seoul National University and Post-doctoral studies from IBM Almaden Research Center in California, USA. He is a Professor of Kumoh National Institute of Technology located at Gumi in South Korea.

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