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Seminar

Institute for Plasma Research

Title : Super-Hydrophobic Nano-Silica Powder Spray for Water-Repellence

Speaker: Dr. Janki Shah

Institute for Plasma Research, Gandhinagar

Date : 11th June 2021 (Friday)

Time : 03:30 PM

Venue : Online - Join the talk:

<https://meet.ipr.res.in/Janki-Shah-PDF-talk>

Abstract

Superhydrophobic surfaces that inspired by lotus leaf have developed rapidly in recent years [1]. Such surfaces have satisfactory applications for anti-corrosion, anti-icing, self-cleaning, drag reduction, oil purification, and medical science, etc [2]. Multiple methods have been developed to create air-trapping and low energy surfaces, such as, chemical etching, sol-gel, chemical vapor deposition, electrodeposition, laser irradiation, ion beam irradiation etc [3,4]. Often making such coatings durable and over a larger area is a difficult task. In the present study, hydrophobic silica emulsion was made using sodium silicate, deionized water, hydrochloric acid, silane compound and adhesive by sol-gel method. The suspension was heated and cooled down to room temperature. Then the foam was collected by filtration and heated at room temperature. Finally, the emulsion was spray dried and Superhydrophobic silica nanoparticles were obtained. The silica pallet was characterised by Contact angle (CA) measurement, XRD, SEM, FTIR. The effect of heating temperature of silica and concentration of surfactant in emulsion were studied for enhancing water contact angle on PU sponge, Glass slide, Filter paper, Stainless steel mesh, regular paper and cotton fabric. The spray coating method is economic, simple, and convenient for substrates with different shape compared to dip coating technology. Overall, proposed work is focused on improving structure stability and durability of the water repellent property of different surfaces. The method is sustainable and economic friendly, which can be easily implemented for daily use and industry applications.

References:

- [1.] Wang, D., Sun, Q., Hokkanen, M.J., Zhang, C., Lin, F.Y., Liu, Q., Zhu, S.P., Zhou, T., Chang, Q., He, B. and Zhou, Q., **2020**. Design of robust superhydrophobic surfaces. *Nature*, 582(7810), pp.55-59.
 - [2.] Fürstner, R., Barthlott, W., Neinhuis, C. and Walzel, P., **2005**. Wetting and self-cleaning properties of artificial superhydrophobic surfaces. *Langmuir*, 21(3), pp.956-961.
 - [3.] Zhang, Y.L., Xia, H., Kim, E. and Sun, H.B., **2012**. Recent developments in superhydrophobic surfaces with unique structural and functional properties. *Soft Matter*, 8(44), pp.11217-11231.
 - [4.] Singh, N.S., Zhang, J., Stafford, J., Anthony, C. and Gao, N., **2021**. Implementing Superhydrophobic Surfaces within Various Condensation Environments: A Review. *Advanced Materials Interfaces*, 8(2), p.2001442.
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