

Title: Development of hydrophobic and oleophobic surfaces using novel nanomaterials

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ABSTRACT

Superhydrophobic surfaces have attracted a lot of attention due to its unique properties such as self-cleaning, anti-contamination and anticorrosion. Even though, extensive research has been conducted on developing water repellent surfaces, there has not been much work done on developing surfaces with both hydrophobic and oleophobic properties. The aim of this study was to develop a superhydrophobic and oleophobic surface using the strategy of high surface roughness and low surface energy materials. For this purpose, high surface roughness was achieved using SiO_2 nanoparticles and low surface energy was incorporated by fluorinated polymer polytetrafluoroethylene (PTFE). In this study, Silica nanoparticles were synthesized using the sol-gel method followed by hydrophobic Hexadecyltrimethoxysilane HDTMS silane modification. Silica nanoparticles and modified silica nanoparticles were characterized using Fourier Transform Infra-Red (FT-IR) spectroscopy, X-ray Diffraction (XRD) technique and Scanning Electron Microscopy (SEM). Modified SiO_2 nanoparticles were suspended in the solution of polytetrafluoroethylene (PTFE). Glass slides (25 mm × 75 mm) were dipped in the solution and

dried in an oven at 80ºC for 8 hours. Oleophobicity of prepared glass slide was tested using oils such as Glycerol (64 mN/m), PEG (47.7 mN/m), aniline (42.67 mN/m), paraffin (26 mN/m) and baby oil. It was found that hydrophobicity of the coating depended on the HDTMS modified silica concentration. Coating contain 52.50% of HDTMS modified SiO_2 /PTFE (w/w %) exhibited superhydrophobicity with an average water contact angle of 158.16º same showing contact angle 133.46º, 110.62º and 81.103º for glycerol, PEG and aniline. Maximum glycerol, PEG and aniline contact angles (133.46º, 127.34º and 108.06º) were with 40.00% HDMTS SiO_2 in PTFE. It can be concluded that HDMTS modified micro-nano structure coupled to low surface energy PTFE showed a promising superhydrophobic and oleophobic surface.

Biography

Liyanage Devthilni P Fernando has completed her Undergradute degree at the age of 24 years from Faculty of Science, University of Colombo, Sri Lanka. She obtained a Bachelor of science degree with First class Honors (GPA 3.8) and awarded a gold medal for Organic Chemistry . She is a Temporary Lecturer at Department of Chemistry, Faculty of Science, University of Colombo. She has done collegiate presentation on “Applications of metal oxide nanostructures immobilized on paper matrices” Oral presentation; in partial fulfillment of the requirements for the undergraduate research project. Her research interest are on nanotechnology, polymer science, Surface chemistry.

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