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Author: M. Ramezani M.R. Vaezi A. Kazemzadeh



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Preparation of silane-functionalized silica films via two-step dip coating sol-gel and evaluation of their superhydrophobic properties

M. Ramezani ^{a,*}, M. R. Vaezi^a, A. Kazemzadeh^b

^aDivision of Nanotechnology and Advanced Materials, Materials and Energy Research Center, P.O. Box 31787-316, Karaj, Iran

^bDivision of Semiconductors, Materials and Energy Research Center, P.O. Box 31787-316, Karaj, Iran

Abstract:

In this paper, we study the two-step dip coating via a sol-gel process to prepare superhydrophobic silica films on the glass substrate. The water repellency of the silica films was controlled by surface silylation method using isooctyltrimethoxysilane (iso-OTMS) as a surface modifying agent. Silica alcisol was synthesized by keeping the molar ratio of ethyltriethoxysilane (ETES) precursor, ethanol (EtOH) solvent, water (H₂O) was kept constant at 1:36:6.6 respectively, with 6 M NH₄OH throughout the experiment and the percentages of hydrophobic agent in hexane bath was varied from 0 to 15 vol.%. The static water contact angle values of the silica films increased from 108° to 160° with an increase in the vol. % of iso-OTMS. At 15 vol%. of iso-OTMS, the silica film shows static water contact angle as high as 160°. The superhydrophobic silica films are thermally stable up to 440 °C and above this temperature, the silica films lose superhydrophobicity. By controlling the primer particle size of SiO₂ about 26 nm, leading to decrease the final size of silica nanoparticles after modification of nanoparticles by isooctyltrimethoxysilane about 42 nm. The films are transparent and have

*Corresponding author. Tel: + 98 9112146943; fax: + 98 26 36280030.

E-mail address: m.ramezani@merc.ac.ir (M. Ramezani).

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