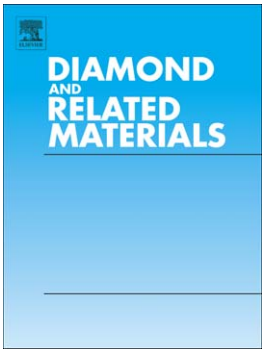

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Characterization of superhydrophobic a-C:F thin film deposited on porous silicon via Laser ablation of a PTFE target

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Abstract

Fluorinated amorphous carbon (a-C:F) thin films are deposited on both flat silicon and porous silicon (PS) surfaces via laser ablation of a polished polytetrafluoroethylene (PTFE). Porous silicon (PS) is prepared by anodic etching of p-type silicon wafers in HF based solution. The film deposited on the flat silicon surface exhibits a highly hydrophobic state with water contact angle (WCA) of ~ 146^{o}. In comparison, the surface of film deposited on PS layer shows a roll-off superhydrophobic state, where the water droplet is seen to roll off without wetting its surface with contact angle hysteresis of ~ 4.5^{o}. Micro-Raman results show that the graphite domain of the film deposited on PS has higher disorder level and lower average gain size. The effect of substrate porosity on chemical composition of deposited films has been investigated by using both Fourier transform infrared (FTIR) and X-ray photoelectron spectroscopy (XPS). It is found that the porous substrate improve the incorporation of the fluorine into the film. Atomic force microscopy (AFM) results revealed that the film deposited on PS has higher surface roughness and lower grain size as compared to the film deposited on flat silicon surface.

Keywords: Fluorinated carbon, Laser ablation, Porous silicon, Superhydrophobic, Micro-Raman, XPS, FTIR, AFM.