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Surface energy modification of AFP film at low temperature by PECVD of controlling the plasma process with hydrogen gas

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Hydrophobic surfaces, with a water contact angle greater than 140 degree, have been attracted much interest for both fundamental research and applications. In this study, Anti finger print (AFP) films were deposited on polymers and glass substrate by plasma enhanced chemical vapor deposition (PECVD) at low temperature (< 60℃). AFP films were synthesized by using hexamethyldisilazane (HMDS) precursor with hydrogen gas. The input power in the RF plasma and flow rate of hydrogen gas were changed to the surface energy properties of the AFP film. The spatial distribution of ionization efficiency was characterized by residual gas analyzer (RGA). In addition, the surface energy was measured by contact angle measurement (CA). The contact angle increases from 107° to 147° because of the surface morphology effect and chemical binding structures. The surface morphology was characterized by atomic force microscopy (AFM). The morphology of AFP film with increasing hydrogen gas and RF power increases from 0.3 nm to 23 nm (Rms). And the chemical properties of the coatings were examined by Fourier transform infrared spectroscopy (FT-IR). The chemical structures of AFP film, CH peaks were increased by RF power and hydrogen flow rate. The surface energy of the $SiO_xC_yH_z$ films produced using plasma process. It could be controlled by employing the appropriate intensity of excited neutrals, ionized atoms, molecules and energy (input RF power), as well as the suitable dissociation of HMDS. In addition, AFP film is successfully synthesized to the contact angle above 150° by controlled surface morphology and chemical structure.

Keywords
surface energy
HMDS precursor
chemical structure
plasma process