SW-P016

Stability of hydrophobic properties of plasma polymerized tetrakis(trimethylsilyloxy)silane film surface

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Hydrophobic thin films are variously applicable for encapsulation of organic devices and water repulsive glass, etc. In this work, the stability of hydrophobic characteristics of plasma polymerized tetrakis (trimethylsilyloxy) silane (ppTTMSS) thin films were investigated. The films were deposited with plasma enhanced chemical vapor deposition (PECVD) on the glass. The deposition plasma power and deposition pressure was 70 W and 600 mTorr, respectively. Thereafter, deposited films were treated by 248nm KrF excimer laser. Stability of hydrophobic properties of plasma polymerized tetrakis(trimethylsilyloxy)silane film surface was tested by excimer laser irradiation, which is thought to simulate severe outdoor conditions. Excimer laser irradiation cycles changed from 10 to 200 cycles. The chemical structure and hydrophobicity of ppTTMSS films were analyzed by using Fourier transform infrared (FTIR) spectroscopy and water contact angle (WCA) measurement, respectively. Absorption spectra peaks and WCA of excimer laser treated ppTTMSS films did not change notably. These results show that our ppTTMSS films possess stable hydrophobic properties.

Keywords: tetrakis(trimethylsilyloxy)silane, Plasma enhanced chemical vapor deposition, Excimer laser, Fourier transform infrared spectroscopy, Water contact angle.

SW-P017

A study of the light trapping mechanism in periodically honeycomb texture-etched substrate for thin film silicon solar cells

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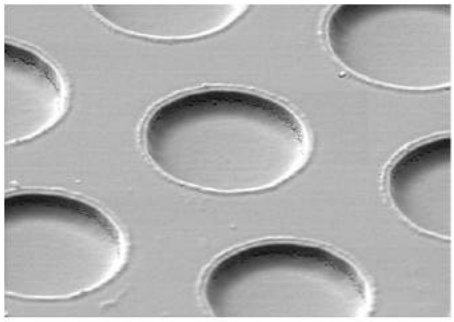
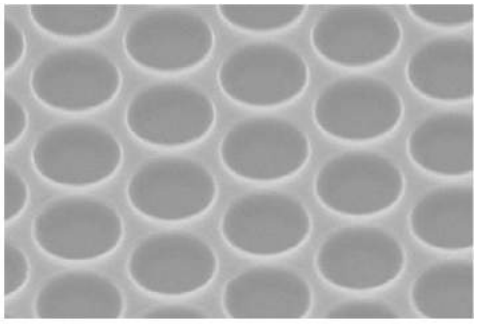
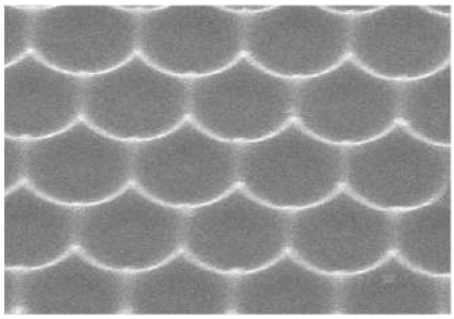
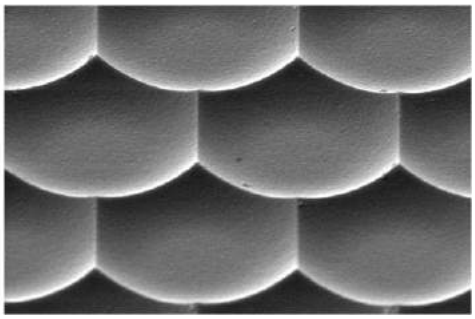
Light management technology is very important for thin film solar cells, which can reduce optical reflection from the surface of thin film solar cells or enhance optical path, increasing the absorption of the incident solar light. Using proper light trapping structures in hydrogenated amorphous silicon (a-Si:H) solar cells, the thickness of absorber layers can be reduced. Instead, the internal electric field in the absorber can be strengthened, which helps to collect photon generated carriers very effectively and to reduce light-induced loss under long-term light exposure. In this work, we introduced a chemical etching technology to make honey-comb textures on glass substrates and analyzed the optical properties for the textured surface such as transmission, reflection and scattering effects. Using ray optics and finite difference time domain method (FDTD) we represented the behaviors of light waves near the etched surfaces of the glass substrates and discussed to obtain haze parameters for the different honey-comb structures. The simulation results showed that high haze values were maintained up to the long wavelength range over 700 nm, and with the proper design of the honey-comb structure, reflection or transmission of the glass substrates can be enhanced, which will be very useful for the multi-junction (tandem or triple junction) thin film a-Si:H solar cells.

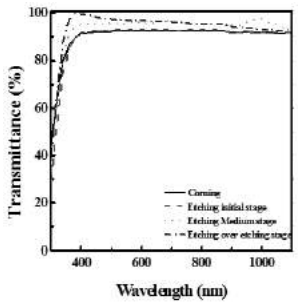
Keywords: light trapping, etching, FDTD, honey-comb structure

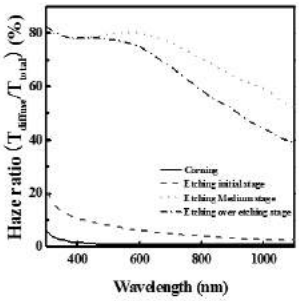


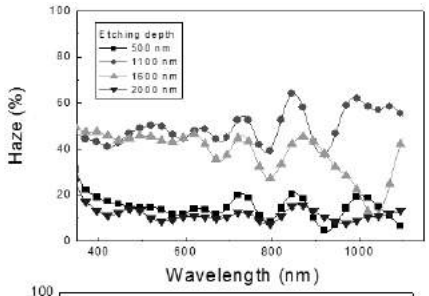


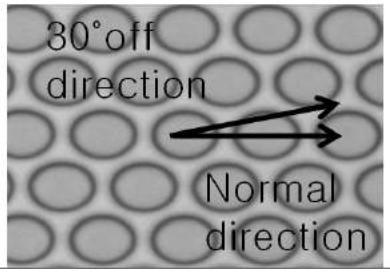


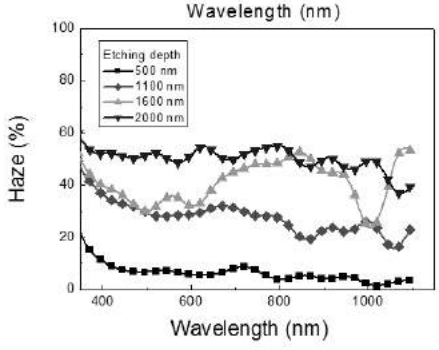



Transmittance (%)
Wavelength (nm)
Corning
Etching initial stage
Etching Medium stage
Etching over etching stage


Haze ratio (T_diffuse/T_total) (%)
Wavelength (nm)
Corning
Etching initial stage
Etching Medium stage
Etching over etching stage


Haze (%)
Wavelength (nm)
Etching depth
500 nm
1100 nm
1600 nm
2000 nm


30°off direction
Normal direction


Haze (%)
Wavelength (nm)
Etching depth
500 nm
1100 nm
1600 nm
2000 nm