Low temperature depositions of silicon compound films by ECR plasma enhanced chemical vapor deposition method

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In this research, we report the preparation and the characterizations of high quality SiO_2 and SiC thin films at low substrate temperatures by Electron Cyclotron Resonance Plasma Enhanced Chemical Vapor Deposition (ECR PE-CVD). Oxygen and tetraethoxysilane (TEOS) serving as plasma and source gases respectively are used for the SiO_2 depositions, whereas hydrogen and hexamethyldisilane (HMDS) are used as plasma and source gases for the SiC depositions. When a grounded metal mesh is inserted into the downstream plasma, the reaction plasma has been found to suit the best condition for low temperature film depositions. The decomposition reactions of TEOS and HMDS molecules by upstream plasma radicals and the film deposition mechanisms have also been investigated in detail.

Moreover, the films are also deposited on the polymer substrates at the room temperature and the film hardness is observed. The tribological properties of the polymer surfaces enhanced by these films. In addition, the polymer surface gloss is increased by SiO_2 coatings. Also, SiC has strong absorption in the UV region of the spectrum, preferably below 300 nm and this leads to suppress the polymer photo-degradation. It has been concluded that the SiO_2 and SiC films prepared by ECR PE-CVD using the mesh is effective in improving the surface quality of the general purpose polymer materials.