

PO1087

**Adhesion of a-SiC:H and a-SiOC:H films deposited on silicon wafers by PECVD**

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Adhesion of thin film to the substrate is one of the most important properties in determining its application possibilities. Thin films of hydrogenated amorphous carbon-silicon (a-SiC:H) and hydrogenated amorphous carbon-silicon oxide (a-SiOC:H) alloys were deposited on silicon wafers from tetravinylsilane (TVS) monomer or its mixtures with argon or oxygen gases by plasma-enhanced chemical vapor deposition (PECVD). The silicon wafers were pretreated with argon or oxygen plasmas (10sccm, 5.7 Pa, 5-200 W) using continuous wave for 10min to clean the surface from adsorbed gases and reach reproducible adhesion of thin films. A total mass flow rate of 3.8 sccm was used for film deposition; the argon or oxygen fraction in gas mixture was set to 0.92. Pulsed plasma was employed to deposit thin films at an effective power ranging from 2 to 150 W. Three sets of thin films with a thickness of 0.1  $\mu\text{m}$  were deposited from pure TVS, TVS/Ar, and TVS/O<sub>2</sub> mixtures to be tested by scratch test using a conical (90°) diamond tip with a radius of 1  $\mu\text{m}$ , loading up to 10 mN at a loading rate of 20 mN/min, and using a scratch length of 10  $\mu\text{m}$ . The film adhesion was characterized by the critical load that is defined as the load at which the adhesive failure occurs in the scratch track observed by atomic force microscopy. The critical load corresponding to a-SiC:H films deposited from pure TVS started at 2.0 mN (2 W), sharply increased to 3.9 mN (25 W), and then slightly varied 3.8-4.2 mN for higher powers (25-150 W). Whereas, the adhesion of a-SiC:H films deposited from TVS/Ar mixture was almost independent of power (2-150 W) with the critical load varying about 3.5 mN. For a-SiOC:H films deposited from TVS/O<sub>2</sub> mixture, the critical load started at 2.6 mN (2 W), sharply increased to the maximum at 6.5 mN (10 W), and then decreased with enhanced power to 3.7 mN (150 W). We found out that changes in power (5-200 W) applied for pretreatment of silicon wafers by argon or oxygen plasmas do not affect the film adhesion.

**Keywords**

PECVD

thin films

adhesion

scratch test