TW-P005

The Characteristics of Plasma Polymerized Carbon Hardmask Film Prepared by Plasma Deposition Systems with the Variation of Temperature

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In this study, we investigated the deposition behavior and the etch resistivity of plasma polymerized carbon hardmask (ppCHM) film with the variation of process temperature. The etch resistivity of deposited ppCHM film was analyzed by thickness measurement before and after direct contact reactive ion etching process. The physical and chemical properties of films were characterized on the Fourier transform infrared (FT-IR) spectroscope, Raman spectroscope, stress gauge, and ellipsometry. The deposition behavior of ppCHM process with the variation of temperature was correlated refractive index (n), extinction coefficient (k), intrinsic stress (MPa), and deposition rate (A/s) with the hydrocarbon concentration, graphite (G) and disordered (D) peak by analyzing the Raman and FT-IR spectrum. From this experiment we knew an optimal deposition condition for structure of carbon hardmask with the higher etch selectivity to oxide. It was shown the density of ppCHM film had 1.6～1.9 g/cm3 and its refractive index was 1.8～1.9 at process temperature, 300～600°C. The etch selectivity of ppCHM film was shown about 1:4～1:8 to undoped siliconoxide (USG) film (etch rate, 1300 A/min).

Keywords: Amorphous carbon, Hardmask, Plasma polymerization, and CVD, Raman, FT-IR, Intrinsic stress, Refractive index

TW-P006

Change the Properties of Amorphous Carbon Hardmask Film Prepared with the Variation of Process Parameters in Plasma Enhanced Chemical Vapor Depostion Systems

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In this study the amorphous carbon films were deposited by PECVD at the substrate temperature range of 250 to 600°C, and the process conditions of higher and lower precursor flow rate, respectively. The temperature was a main parameter to control the density and mirco-structures of carbon films, and their's properties depended with the process temperatrue are changed by controlling precursor flow rate. The precursor feeding rate affect on the plasma ion density and a deposition reactivity. This change of film properties was obtained the instrinsic stress, FT-IR & Raman analysis, refractive index (RI) and ext. coef. (k) measured by ellipsometer. In the process conditions of lower and higher flow rate of precursor it had a different intrinsic stress as a function of the substrate temperature.

Keywords: PECVD, hard mask, amorphous carbon, etch selectivity