

## Effect on the CN<sub>x</sub> molecular behavior in N<sub>2</sub> plasma during deposition of carbon nitride film by RF magnetron sputtering

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Carbon nitride films were deposited on Si(100) substrates by RF magnetron sputtering at different working pressure and gas ratio. The influence of gas pressure on the growth mechanism and chemical structure of the carbon nitride films has been discussed. The composition and bond structure were analyzed by Fourier transform infrared spectroscopy (FTIR) and X-ray photoelectron spectroscopy (XPS). Quadrupole mass spectrometer (QMS) was fitted with the chamber to investigate C<sub>x</sub>N<sub>y</sub> molecular species in gas phase. The increase of film growth rate was observed with increasing working pressure and nitrogen proportion in the sputtering gas. However, film growth rate decreased when the working pressures were over ~10 mTorr. The N/C ratios in the CN<sub>x</sub> film were in the range of 0.52-0.67, increased with working pressure. The results from XPS and FTIR spectra confirmed that the decrease of working pressure resulted in sp<sup>3</sup> C-N bonds increase comparing with sp<sup>2</sup> C=N bonds. It could be concluded that the decrease of C<sub>2</sub>N molecule containing high carbon proportion and increase of CN<sub>2</sub> containing high nitrogen proportion by the increase of working pressure influenced on N incorporation in the films and chemical bonds.