

Effects of thermal and H₂ plasma treatments on the structural and optical properties of amorphous carbon nitride films grown by PECVD

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The carbon nitride films which have excellent mechanical properties would be similar to the crystalline diamond, or more. In this study, the amorphous carbon nitride (a-CN_x) films, fabricated by plasma enhanced chemical vapor deposition (PECVD), were treated by H₂ plasmas and thermal annealing. The effect of thermal and H₂ plasma treatments changed the film thickness, composition, structure, and optical properties, which were investigated by FT-IR, XRD, AFM, PL, and electrophotometer. Various C and N bonds have been observed in the a-CN_x films by FT-IR, such as C-N, C=N, and C≡N. The energy of adatoms in the films was increased by thermal and H₂ plasma treatment. So, the adatoms were migrated in the films and changed the film structures. The FT-IR spectra and reflectivity of the films were also changed by the rearranged and reconstructed film structures, and they were confirmed by XRD peak positions. The PL spectra were decreased with increasing the annealing temperature and the plasma source power, but it contained same energy and three emission peaks.