

A Study on Nano-Tribology of Carbon Based Films Syntheized by Magnetron Sputtering

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Carbon based materials have been the subject of extensive study due to their attractive combination of properties including high hardness, chemical inertness, high wear rate, low friction coefficient high thermal conductivity and biocompatibility. Thus, carbon based materials present a high prospect for a number of industrial applications.

In this research, carbon based films (amorphous carbon(a-C), hydrogenated amorphous carbon(a-C:H), nitrogenated amorphous carbon(a-C:N)) were synthesized by closed-field unbalanced magnetron (CFUBM) sputtering using graphite target on Si(100) wafers. We also fabricated carbon based films with negative DC bias voltage of 200 V in during the deposition in Ar, C₂H₂, N₂ ambients. Doping of hydrogen and nitrogen in a-C films was performed by adding C₂H₂(acethylene) and nitrogen gases at partial preesure of 20 % to the Ar+C₂H₂ and Ar+N₂ mixture gases. The maximum hardness of a-C:H film with hydrogen doping was 26.5 GPa, the low surface roughness value was 0.1 nm and the critical load was 30.5 N. And the low friction coefficient of a-C:N film with nitrogen doping was 0.08. This paper focussed attention on the structural and tribological properties of carbon based materials caused by H and N doping.