PRODUCTION AND CHARACTERIZATION OF NANOCOMPOSITE AMORPHOUS CARBON THIN FILMS

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Abstract

Carbon based films can combine the properties of solid lubricating graphite structure and hard diamond crystal structure, i.e., high hardness, chemical inertness, high thermal conductivity and optical transparency without the crystalline structure of diamond. Issues of fundamental importance associated with nanocarbon coatings are reducing stress, improving adhesion and compatibility with substrates. In this work new nanocomposite coatings with improved toughness based in nanocrystalline phases of metals and ceramics embedded in amorphous carbon matrix will be developed: nc-MeNxCy/a-C(Me) with Me =Cu, Al, Ti, Si etc.. These novel coating architectures will be adopted with the objective to decrease residual stress, improve adherence and fracture toughness, obtain low friction coefficient and high wear-resistance. The characterisation of the coating's physico-mechanical properties will be presented in order to understand the influence of the deposition parameters and metal content used within the a-C matrix in the coating properties. Film microstructure will be characterized by XRD and Raman Spectroscopy. In order to characterize morphology SEM and AFM will be used. Contact angle and surface energy will be also analysed for different surface layers. Adherence will be studied by scratch test and hardness by Nanoindentation. Residual stresses in the produced coatings will be analysed by bending technique.

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