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Preparation and characterization of high quality diamond like carbon films on Si microspheres

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Abstract: High quality diamond like carbon (DLC) films are urgent demanded for inertial confinement fusion (ICF) experiments. DLC films with excellent qualities were deposited on Si microspheres by coupling anode-layer ion source and RF magnetron sputtering. The obtained films were characterized by field emission scanning electron microscopy (FE-SEM), atomic force microscopy (AFM), Raman spectroscopy, X-ray photoelectron spectroscopy (XPS), X-ray Reflectivity (XRR) and nanoindentation techniques. The films deposited under coupling anode-layer ion source and RF magnetron sputtering exhibit denser microstructure and smoother surface with lower surface roughness. Meanwhile, the mechanical properties and mass density of these films experience an improvement compared to those only prepared by either conventional RF magnetron sputtering or anode-layer ion source. DLC films deposited by coupling anode-layer ion source and RF magnetron sputtering can be a better candidate for ICF experiments.

Keywords: Amorphous materials; Carbon materials; Sputtering; XPS

1. Introduction

Diamond like carbon films (DLC) have attracted substantial attentions owing to its outstanding properties, which have been widely used in industrial applications [1-5]. Recently, inertial confinement fusion (ICF) is regarded as a potentially important option to secure the global energy demand in a sustainable fashion [6, 7]. However,

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