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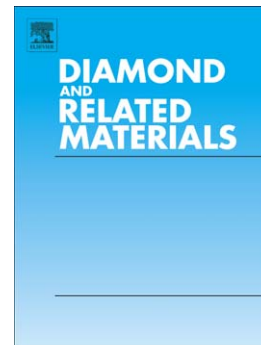
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Polymeric amorphous carbon films with high hardness

X. Wei, X. Chen, X. Ren, Q. Lu, L. Zhang, F. Wang*

Department of Physics, Xiamen University, Xiamen, Fujian 361005, China

Abstract:

Polymeric amorphous carbon films are grown from acetylene precursor gas using the immersive PECVD method. The optical and mechanical properties of the obtained samples are measured and compared to those grown from methane precursor gas using a similar method. The samples are found to have similar optical properties such as Tauc gap and refractive index, while having significantly different mechanical properties. Samples grown from acetylene have over 200% increases in their micro-hardness and residual stress over those from methane. Even with the significant increase, the residual stress of the samples from acetylene is still very low (< 0.9 GPa), making this type of amorphous carbon films suitable for many applications. The sp^2 ternary phase diagram is used to show the distinctivity of the microstructures of the obtained samples, and in the process demonstrates itself as a useful tool for characterizing and classifying amorphous carbon films.

Keywords: polymeric amorphous carbon; acetylene; hardness; ternary phase diagram.

1. Introduction

Carbon based material is gaining more and more attention due to their richness in phenomena and applications [1-3]. Amorphous carbon is a form of carbon which

* Corresponding author. E-mail: fumingw@xmu.edu.cn (F. Wang)

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