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Control of residual stress of tetrahedral amorphous carbon thin film deposited on dielectric material by filtered cathodic vacuum arc source by using mid-frequency pulse bias voltage

Jung-Hwan In, Young-Bok Kim, Yeon Hwang, Ju Hyeon Choi*

Korea Photonics Technology Institute (KOPTI), Advanced Optical Lens Research Center, 9, Cheomdan venture-ro 108beon-gil, Buk-gu, Gwangju, 61007 Republic of Korea

Corresponding Author : Ju Hyeon Choi

Postal address : Korea Photonics Technology Institute (KOPTI), Advanced Optical Lens Research Center, 9, Cheomdan venture-ro 108beon-gil, Buk-gu, Gwangju, 61007 Republic of Korea

e-mail : juchoi2@kopti.re.kr

Telephone : +82-62-605-9265

Fax : +82-62-6059269

Abstract

It was shown that the residual stress of the tetrahedral amorphous carbon (ta-C) thin film deposited on insulating material by filtered cathodic vacuum arc (FCVA) source can be controlled with mid-frequency pulse bias voltage. The residual stress of ta-C thin film decreased monotonically with the substrate pulse bias when the base material to be coated was insulating. There was not the apparent peak of residual stress about the substrate pulse bias which appeared for the electrically conducting base material. It was observed that the residual stress increased with the arc current and dielectric thickness at some pulse voltage range (100 V ~ 1000 V). The sp³ contents calculated by using Raman spectra and the surface hardness values as a function of substrate pulse voltage showed the similar trend with the residual stress values. For ta-C thin film deposited on the polished alumina sample, it was

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