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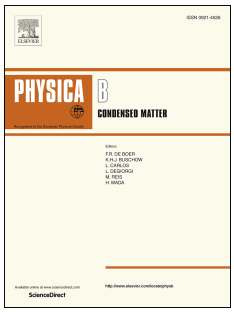

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Jun Zhu, Quan Wang

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Excitation wavelength dependence of Raman scattering and substrate dependence on hydrogenated silicon-based thin film

Jun Zhu[1], Quan Wang[1,2*]

1. *School of Mechanical Engineering, Jiangsu University, Zhenjiang 212013, P.R. China*
2. *State Key Laboratory of Transducer Technology, Chinese Academy of Sciences, Shanghai 200050, P.R.China*

Abstract

Thin films of hydrogenated silicon-based thin film were deposited on Corning 7059 glass and single-crystalline silicon substrates in a capacitive-coupled radio-frequency (13.56 MHz) plasma-enhanced chemical vapor-deposition system in the presence of direct-current bias stimulation. The thickness of the films was measured using a surface profile–measuring system. X-ray diffraction was employed to characterize the structure of the silicon films and determine the grain size. Raman spectroscopy was carried out to verify the crystalline structure and to illustrate the structural composition of the silicon films. Raman scattering is exerted on those films by three different excitation wavelengths, from red to near ultraviolet. It is validated that the Raman spectrometry is different by varying the incident wavelength. The experiment result is well explained and it is inferred that suitable laser should be chosen to get further information of material microstructure. The topography and the roughness of the films were investigated using atomic force microscopy. Small differences were found to exist in the film thickness and the deposition rate was unaffected by the use of different substrates, whereas the microstructure of the thin films varied with the different substrates. Under the same deposition conditions, the films on single-crystalline silicon showed better crystallinity than those on glass substrates, while they had much smaller root-mean-square roughness

* Author to whom correspondence should be addressed. Electronic mail: wangq@mail.ujs.edu.cn