UNIVERSITI TEKNOLOGI MARA

SYNTHESIS AND CHARACTERIZATION OF NANOCRYSTALLINE SILICON THIN FILMS ON TEFLON SUBSTRATES BY RF MAGNETRON SPUTTERING

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of my own work unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

Studies on the growth of nanocrystalline silicon (nc-Si) on teflon substrate are being studied. The preparation was done by using direct deposition of Radiofrequency (RF) magnetron sputtering method. The physical and crystallinity of thin films was studied and investigated to focus on various deposition parameters such as RF power, deposition temperature, sputtering pressure and argon gas flow rate. The physical structures of the thin films were observed by using field emission scanning electron microscope (FESEM), JOEL JSM 7600F and Surface Profiler (SP, KLA Tencor P-6). The crystallinity of the thin films was observed by Raman spectroscopy (Horiba Jobin Yvon). Through the investigation, we found that at room temperature, the deposited thin film was amorphous, however, crystallization started to occur when the substrate was heated, resulting that the deposited thin films are nc-Si thin films. The film thickness and the deposition rate increased with a substrate temperature except for the room temperature deposition. The grains seemed to be more dense for the deposition at higher temperature compared to the lower temperature. We also found that the thickness of thin films increased with increased RF power and deposition temperature. Raman spectroscopy results is shown that, with increasing RF power and deposition temperature can cause the changing of crystallinity on both glass and teflon substrate. From optimization result, the nc-Si thin films deposited at RF power 200 W, deposition temperatures 150 ^{o}C, sputtering pressure 7 mTorr and 40 sccm Ar gas flow rate, which gives the highest crystallinity based on Raman shift results compared to others thin films. In this thesis we also studied on the resistive switching on the nc-Si sub-oxide for memristive device applications.

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