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Effect of the Deposition Time of Hydrogenated Nanocrystalline Si Grown on Porous Alumina Film on Glass Substrate by Plasma Processing Chemical Vapor Deposition

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Abstract : Plasma Enhanced Chemical Vapor Deposition (PECVD) method is used to deposit hydrogenated nanocrystalline silicon films (nc-Si: H) on Porous Anodic Alumina Films (PAF) on glass substrate at different deposition duration. Influence of the deposition time on the physical properties of nc-Si: H grown on PAF was investigated through an extensive correlation between micro-structural and optical properties of these films. In this paper, we present an extensive study of the morphological, structural and optical properties of these films by Atomic Force Microscopy (AFM), X-Ray Diffraction (XRD) techniques and a UV-Vis-NIR spectrometer. It was found that the changes in DT can modify the films thickness, the surface roughness and eventually improve the optical properties of the composite. Optical properties (optical thicknesses, refractive indexes (n), absorption coefficients (α), extinction coefficients (k), and the values of the optical transitions EG) of this kind of samples were obtained using the data of the transmittance T and reflectance R spectra's recorded by the UV–Vis–NIR spectrometer. We used Cauchy and Wemple–DiDomenico models for the analysis of the dispersion of the refractive index and the determination of the optical properties of these films.

Keywords : hydragenated nanocrystalline silicon, plasma processing chemical vapor deposition, X-ray diffraction, optical properties
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