Structural and optical properties of RF sputtered Si$_x$C$_{1-x}$ thin films

A. ElKhalfi, E. Ech-chamikh*, Y. Ijdiyaou, M. Azizan and A. Essafti

Laboratory Solid State Physics and Thin Films, Faculty of Sciences Semlalia, Cadi Ayyad University, P.O.Box 2390, Marrakech 40000, Morocco

Silicon carbide (Si$_x$C$_{1-x}$) thin films with various Si/C ratio values have been deposited by radio-frequency (RF) co-sputtering. These films were deposited, at different RF powers, from a composite target consisting of Si fragments regularly distributed on the surface of a pure graphite target. The Si content in the deposited films was varied by varying the target partial surface covered by the Si ships from 17% to 33% of the total target surface. Structural properties of the obtained films have been studied by Grazing Incidence X-ray Diffraction (GIXD) while optical properties (especially the refractive index, absorption coefficient and optical band gap) were investigated by optical transmission measurements in the Ultraviolet-Visible-Near Infrared wavelengths range. GIXD diagrams show that all the as deposited Si$_x$C$_{1-x}$ thin films are amorphous. The deposition rate of the a-Si$_x$C$_{1-x}$ thin films increases with the RF power and the Si fragments surface coverage ratio. For the explored ranges of Si compositions and RF powers, the optical band gap $E_g$ varies from 1.7 to 2.2 eV. $E_g$ increases with increasing the Si content or decreasing the RF power.

**Keywords:** RF sputtering, Optical properties, Silicon carbides, Optical transmission.

* E-mail: ech-chamikh@ucam.ac.ma