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DLC-Si THIN FILMS DEPOSITED BY REACTIVE SPUTTERING: STRUCTURAL AND OPTICAL EVOLUTIONS.

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DLC-Si thin films can be used in a large number of optical applications such as filters, mirrors, antireflective coatings but also as protective coatings against scratch of optical devices. Indeed, Silicon-incorporated diamond like carbon films have a great potential for technological applications due to the possibility of varying its optical gap by changing the silicon/carbon contents in the coating.
In this study, radiofrequency sputtering using silicon target and various argon/methane flow rates was used to deposit SiC:H thin films. The layer composition was investigated by Rutherford Backscattering Spectroscopy (RBS) using 2 MeV alpha particles Chemical bonding was determined using Fourier Transform infrared spectroscopy (FTIR). The variations of electron spin resonance parameters, the peak-to-peak linewidth DHpp, g-factor and the spin density, as a function of the film preparation are discussed on the basis of the complete physico-chemical characterization. To estimate the optical band gap and Urbach energy, transmission spectra were recorded using a double beam Perkin Elmer UV–visible spectrometer in the range of 200–1100 nm. The results were completed with phase modulation spectroscopic ellipsometry measurements using a Jobin–Yvon UVISEL FUV instrument in 190–826 nm (1.5–6.5 eV) spectral range to have access to refractive index and extinction coefficient. We show that the films are amorphous, don't possess a specific stoichiometry but the composition of the films could be changed by varying the argon/methane gas flow ratio. The change of this parameter influences the sputtering yield of the silicon target and obviously the chemical reactions in the plasma.
As application, this material can be a good candidate for graded refractive index coating in the case of photovoltaic solar cells.

Keywords
DLC
Structure
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