

KN1300

**SiC<sub>x</sub>N<sub>y</sub>:H thin films deposited by plasma processes: opportunity as optical coatings for PV applications**

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Hydrogenated Ternary materials such as silicon carbo-nitride (SiC<sub>x</sub>N<sub>y</sub>: H) are very exciting materials. Indeed, preparing SiC<sub>x</sub>N<sub>y</sub>: H with different composition allows obtaining coating with unique physical and chemical properties. This class of materials has attracted much attention, because it exhibits new features different from that of the mixtures of SiC and Si<sub>3</sub>N<sub>4</sub>. This kind of compound could be used to improve thin-film solar cells light absorption. Indeed, it is important to reduce their reflection at their top surface. Such a property could be achieved with the application, on a substrate, of a one-layer film for a limited wavelength range or a multilayer coating for a broad wavelength range. The challenge is to use graded composition SiC<sub>x</sub>N<sub>y</sub>: H thin film, and so graded optical properties, once again to transfer the employed technology, economically viable, to the PV industry. For this goal, SiC<sub>x</sub>N<sub>y</sub>: H thin films with various compositions were deposited by sputtering in order to, in a first step determine their structure and, in a second step, explain the optical properties evolution versus the material composition and structure. For that, different coatings have been deposited by sputtering a silicon target under mixed Ar-N<sub>2</sub>-CH<sub>4</sub> atmosphere, at room temperature and at 400 °C.

This very complete work permits to suggest structure using ion beam analysis and Infrared spectroscopy. With powerful method such as Electron Spin Resonance spectroscopy we identify the dangling bonds and spin density. The optical properties, in terms of refractive index, extinction coefficient, optical gap, and Urbach parameter, were determined by spectroscopic ellipsometry and UV-Visible (UV-Vis) spectroscopy. The main step forward of this work will be also to show that the use of Nuclear Reaction and Elastic Recoil Detection Analysis allow the determination of the composition but also the total hydrogen in the film.

All these results will be compared to other coatings deposited by PECVD.

**Keywords**

SiCN:H by sputtering

Ion Beam

Optical properties