PO1021

X-ray Photoelectron Spectroscopy (XPS) investigation of SiCxNy:H thin films on Si elaborated by PVD : atomic composition study

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XPS is a surface analysis technique that can be used to determine the surface chemistry of a material in its as-received state or after a treatment, as instance ion beam etching to clean off some or all of the surface contaminations. Detection limits for most of the elements are around one percent. Last few months, the surface IP team has developed a new method for the determination of the correction function of a hemispherical electron analyzer based on elastic electron images [1]. This apparatus parameter is essential for quantitative interpretations of XPS signals.

In the present study, SiCxNy:H thin films with various compositions elaborated by PVD, which could be used as antireflective coating in photovoltaic devices, were characterized by XPS. Firstly, an optimization of the deconvolution parameters for XPS spectra allowed the identification of the different atom bonds. In light of the binding energies obtained for different surface compositions, the results have shown the existence of a preferentially bonding of silicon with carbon or nitrogen. Moreover, Ar+ ion etching was used to determine the composition profile of the created layers using theoretical modeling of XPS signals.

[1] Journal of Electron Spectroscopy and Related Phenomena 197, 2014, 80–87.

Keywords
XPS spectroscopy
Thin films
SiCxNy:H
composition characterization