POLYMER IN DEPTH CHEMICAL AND MOLECULAR CHARACTERIZATION

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ABSTRACT

When developing new devices containing polymer functionnal layers, scientists try to get more and best function in a smaller volume unit that will contain many interfaces. Let's cite only a few examples like chemical sensors, organic light emitting diodes, organic photovoltaic cells or organic memories. These devices that extend in three dimensions (3D) require now new or modernized characterization methods, that are capable to give a snapshot of the 3D composition of the device, and eventually of its modification, due to some ageing (thermal or electrical stress, electrochemical or radiation-induced effects).

This talk will review literature data and present most recent advances, focusing on **X-ray Photoelectron Spectroscopy (XPS)** devoted to the characterization of polymer-containing 3D structures, keeping within the intrinsic possibilities of the technique – that is limited to a spatial resolution of a few micrometer, but with an in-depth resolution of some 10 nanometers.

The new sputtering technique with cluster Ar_n^+ ions will be described ; the influence of the cluster ion energy (x to y Kev) and cluster ion size (1000 to 2000 atoms) will be studied, as for its potential to *quantitatively study in depth distribution of polymer materials*, without destroying the identity of the molecular species. Fingerprinting markers like chemical composition, presence of shake-up peaks, or characteristic valence band spectra will be used to ascertain of the non-degradation of the materials, while quantification will be pushed to its natural limits. The studied samples are from three categories : consisting of a 'thick' layer of polymer, made of multilayers of organic materials including ultra-thin (nanometer range) ones, containing alternating metal-polymer films.