
XPS-depth analysis of plasma polymerized coatings for biomedical applications?

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The interest to use plasma discharges for polymerization has not stopped after the first generation but increases every year. This high demand can be explained by their great importance in many applications and the unique properties of plasma polymers. More than 50 years, researchers make use of plasma polymerization to produce a thin polymeric coating on various substrates. Nevertheless, the Yasuda parameter is a powerful tool to explain the chemical composition and structure of the resulting thin film, a detailed analysis is required for each particular manufacturing process. Plasma polymerization is an excellent method to produce a demanded functionalization on a surface for a specific purpose. A wide range of techniques are used to analyze film properties to verify the declared characteristics. The obtained data with a proper interpretation will lead a researcher to a correct conclusion. This work demonstrates how X-ray photoelectron spectroscopy (XPS) depth analysis using C₆₀ ion sputtering of the film explains the properties of plasma polymerized coatings and how the obtained results correlate with scanning electron microscope (SEM), Fourier-transform infrared spectroscopy (FTIR) and XPS. Two different materials are under investigation in this work: (1) an amine rich film produced by plasma polymerization of cyclopropylamine (CPA) and (2) a thiol rich film produced by plasma polymerization of 1-propanthiol. Both films were made with two different sets of plasma parameters to have a wider range of coating properties. Sputtering of organic samples utilizing a C₆₀ ion beam has been applied to produce significantly less accumulated loss compared to sputtering with monatomic and atomic-cluster ion beams.

Thus, the results obtained with Ar⁺ and C₆₀ ion sputtering are compared to each other. The investigation demonstrates that buckminsterfullerene (C₆₀) sputtering provides more reliable data compared to other techniques and explains the plasma polymerized film properties.

The research has received funding from the European Research Council under the European Union's Seventh Framework Program: (FP/2007-2013) ERC Grant Agreement n.335929 (PLASMATS). The authors acknowledge the support of the Research Foundation Flanders (FWO) for funding their medium scale research infrastructure (C60 ion gun).