

X-Ray Photoelectron Spectroscopy and characterization of the material surface

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Surface science combined with surface analysis is a major activity resulting in contribution to our well being. Advanced technologies require even more performing materials providing superior characteristics in terms of electrical mechanical or chemical properties. Just as an example we can mention graphene, which boosted research in many different areas as energy, sensing, electronics, health... and diamond and quantum technologies which promise to become pervasive in several aspects of everyday life.

This contribution briefly explores photoelectron spectroscopies and, in particular, X-ray photoelectron spectroscopy (XPS) and its use for characterizing the material surface. XPS is a qualitative and quantitative chemical analysis technique. Due to its limited sampling depth XPS is surface-sensitive, i.e. the analysis is confined to the outer few top-layers of the material surface. This enables researchers to obtain the surface composition of the sample and understand how the chemistry influences its interaction with the environment. Through the analysis of high resolution core-lines all the bonds formed by an element are identified and assigned. This enables a control of the stoichiometry which can be used to verify the efficiency of chemical reactions/treatments carried out in different conditions. In this work some examples of the application of XPS to the analysis of advanced materials will be illustrated.

References:

[1] Giorgio Speranza, “Characterization of Carbon Nanostructures by Photoelectron Spectroscopies”, *Materials* 2022, 15, 4434.