Properties of the metal/$PtSe_2$ thin layer interfaces

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The discovery of graphene and its physical properties started a new era in the investigation of thin layer materials [1,2]. Nowadays, these types of materials also include Transition Metal Dichalcogenides (TMD), which provide a wide range of physical properties, such as the values of the charge carrier mobility and bandgap energy, which depend on the layer thickness [3,4]. One of the most promising TMD materials is $PtSe_2$, which exhibits a chemically non-reactive surface, it is crucial to determine the properties of the interfaces formed at the metal/$PtSe_2$ junction. Different metals will form morphologically different structures on the $PtSe_2$ active surface, which requires a comprehensive analysis of both the morphology and physicochemical properties with analysis of the thermal stability of such systems. For this purpose, several measurement methods will be used, ranging from Atomic Force Microscopy (AFM), to Raman and X-Ray Photoelectron Spectroscopy (RS, XPS).

In this presentation, the properties of the metallic layers (eg.Ni,Pd,Ti) with thicknesses between 10-20nm embedded on surface of the bulk crystal $PtSe_2$ will be discussed. Particular emphasis will be placed on mutual interactions in the interfaces obtained in this way, and also include the effect of thermal treatment on the formation of bonds between the layers observed in both the form of vibration modes in RS and the chemical shift in XPS measurements. In each of the systems and temperature discussed, the surface morphology was also analysed using AFM to determine its changes. The observed differences between different types of metals and the $PtSe_2$ layer indicate different properties of such structures, which translate into the operation of sensor devices based on planar architecture. Particularly crucial here is the increase in the surface roughness of the interface, which translates into an improved contact of the interface and the appearance of chemical interactions between $PtSe_2$ and the metallic layer.

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