Tailoring the Properties of Metal-Oxide Interfaces through Graphene

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Metal-oxide interfaces are a topic of great interest since they play a fundamental role in a wide variety of technological applications [1,2]. As the size of devices shrinks down, the role of interfaces becomes more and more important, making the ability of growing well-ordered hetero-structures a fundamental requisite for the development of nanotechnologies. In this framework, the study of 2D materials (graphene, MoS_2, etc.) as buffer layers in metal-oxide heterostructures is still in its infancy.

The focus of this contribution will be on the effects induced by a graphene (Gr) interlayer on the properties of an ultra-thin chromium oxide film grown on a Ni(111) substrate. Auger electron spectroscopy and X-ray photoemission spectroscopy reveal that the graphene layer promotes the formation of a chemically sharp Cr_2O_3/Ni(111) interface. Low energy electron diffraction and scanning tunnelling microscopy show that the surface of Cr_2O_3/Gr/Ni(111) is well-ordered and atomically flat, while the oxide grown on the bare Ni(111) surface develops a rough morphology. Finally, scanning tunneling spectroscopy reveals that the insertion of graphene also modifies the surface electronic properties of the oxide, resulting in a metallic behavior.

References:
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