FOXSI
Functional Oxide Surfaces and Interfaces

EINLADUNG

zum Vortrag
von

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Epitaxial ultra-thin films oxides on Fe
What happens when a low dimensional oxide grows on a highly reactive metal substrate?

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Technische Universität Wien, Institut für Angewandte Physik
Seminarraum 134A, Turm B (gelbe Leitfarbe), 5. OG
1040 Wien, Wiedner Hauptstraße 8-10

Abstract:

The investigation of oxide films with a thickness of a few nanometers or below grown on another substrate is a scientific topic that has recently attracted a huge amount of experimental and theoretical research work. Indeed, many physical phenomena arising in metal-oxide heterostructures have been reported, spanning from magnetic instabilities, charge transfer from metallic substrate, magnetoelectric coupling in multiferroic layered systems, tunneling-induced spin filtering, just to name few. All these phenomena are intimately connected with the structure and the chemistry of the interfacial oxide/metal region. In order to control and to some extent engineer the functionalities of these heterostructures, it is crucial to have a full understanding of the basic mechanisms governing the formation of the oxide/metal interface. In this contribution I will focus on some of the recent advances in understanding the formation of transition metal oxide/Fe interfaces. Fe can be considered from the one hand as a prototypical example of ferromagnetic material, and on the other hand as an example of a highly reactive metal. The former characteristic makes it particularly appealing for spintronic applications and magnetic storage media, while the latter makes the preparation of well-defined oxide/metal interfaces a difficult task. For this reason, despite the large body of literature focusing on the preparation and characterization of ultra-thin oxide films on inert materials such as noble and quasi noble metals, comparatively little is known about the atomic scale mechanisms driving the formation of the transition metal oxide/Fe interfaces. In the first part of the talk I will discuss the stabilization of single-layer-thick oxide films on Fe, by using selected examples involving the deposition of transition metals on the well-ordered and defect-free Fe(001)-p(1 × 1)O surface. This is characterized by one oxygen atom per surface unit cell which can be used as a reservoir for the stabilization and investigation of Fe supported two-dimensional transition metal oxides, avoiding at the same time the Fe oxidation occurring when more traditional preparation procedures (such as for instance metal deposition in a reactive oxygen atmosphere) are employed. In the second part I will discuss the oxide films growth out of the interfacial layer, with particular emphasis on the growth mode leading at the same time to sharp interfaces, useful to correctly modeling the interfacial physical phenomena, and atomically flat surfaces, crucial to allow scanning probe microscopy studies down to the atomic scale.

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