FOXSI
Functional Oxide Surfaces and Interfaces

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EINLADUNG

zum Vortrag
von

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Ternary oxides at the two-dimensional limit:
Metal-Tungstate Nanolayers on Metal Surfaces

am

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TU Wien, Institut für Angewandte Physik, E134
yellow tower „B", 5th floor, Sem.R. DB gelb 05 B (room number DB05L03),
1040 Wien, Wiedner Hauptstraße 8-10

Abstract:

Metal tungstates with the general formula MWO4 (M denotes a bivalent metal cation) belong to a fascinating family of inorganic functional materials possessing a high application potential in various fields, such as in photoluminescence, photoanodes, electrochromic systems, humidity sensors, magnetic properties and catalysis. Metal tungstate compounds have been synthesized mostly in bulk form, but with the advance of nanotechnologies there is a growing interest in preparing MWO4 structures at the nanoscale, whose physical and chemical properties are unexplored as yet. I will show that two-dimensional (2-D) ternary oxide MWOx nanolayers can be fabricated in a well-ordered manner on single crystal metal surfaces using different epitaxial growth routes based on a solid-state chemical reaction in two dimensions. One preparation approach involves the interfacial reaction of (WO3)3 clusters, generated by thermal sublimation of WO3 powder, with native surface oxide phases on Cu(110) and Ni(110) surfaces. As a highlight, the formation of a 2-D CuWO4 layer on Cu(110) will be presented and its novel structural, electronic, vibrational and chemical properties will be discussed. A second synthesis route consists of the formation of structurally well-defined 2-D oxide layers on foreign metal substrates, such as e.g. FeO on Pt(111), onto which the (WO3)3 clusters were deposited and reacted after annealing to elevated temperatures. This procedure results in the epitaxial growth of a honeycomb (2x2)-FeWO3 layer on Pt(111). It consists of a mixed Fe2+/W4+ layer, which is terminated by oxygen atoms in Fe-W bridging positions, forming a buckled honeycomb lattice. DFT calculations predict that the 2-D FeWO3 layer exhibits a ferromagnetic order with a Curie temperature of 95 K, as opposed to the antiferromagnetic behavior in the bulk FeWO4 phase. At the end of my talk, the formation of hexagonally-ordered 2-D MnWO4 and NiWO4 layers on Pd(100) will be briefly discussed. Here, in contrast to the previous two approaches, a wetting c(2x2)-WO3 layer has been first prepared on the Pd(100) surface and subsequently Mn (Ni) atoms were deposited and oxidized in an oxygen atmosphere to form the ternary oxide layers.

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