TECHNISCHE UNIVERSITÄT WIEN

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# IAP-SEMINAR

## ANNOUNCEMENT

Date: **Tuesday, 13.12.2016**
Time: **16:00 s.t.**
Location: **Technische Universität 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

Lecturer: **Ao.Univ.Prof. Dr. Svetlozar Surnev**
Surface and Interface Physics Division, Karl-Franzens-Universität Graz

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

Abstract: Metal tungstates with the general formula $MWO_4$ (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 $MWO_4$ structures at the nanoscale, whose physical and chemical properties are unexplored as yet. I will show that two-dimensional (2-D) ternary oxide $MWO_x$ 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 $(WO_3)_3$ clusters, generated by thermal sublimation of $WO_3$ powder, with native surface oxide phases on Cu(110) and Ni(110) surfaces. As a highlight, the formation of a 2-D $CuWO_4$ 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 $(WO_3)_3$ clusters were deposited and reacted after annealing to elevated temperatures. This procedure results in the epitaxial growth of a honeycomb (2x2)-$FeWO_3$ layer on Pt(111). It consists of a mixed $Fe^{2+}/W^{4+}$ layer, which is terminated by oxygen atoms in Fe-W bridging positions, forming a buckled honeycomb lattice. DFT calculations predict that the 2-D $FeWO_3$ layer exhibits a ferromagnetic order with a Curie temperature of 95 K, as opposed to the antiferromagnetic behavior in the bulk $FeWO_4$ phase. At the end of my talk, the formation of hexagonally-ordered 2-D $MnWO_4$ and $NiWO_4$ layers on Pd(100) will be briefly discussed. Here, in contrast to the previous two approaches, a wetting c(2x2)-$WO_3$ 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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*All interested colleagues are welcome to this seminar lecture*
*(45 minutes presentation followed by discussion).*

*U. Diebold e.h.*
*(Seminar-Chairperson)*

*F. Aumayr e.h.*
*(LVA-Leiter)*