IAP Seminar

Tuesday, 4th December 2018, 16:00 s.t.
TU Wien, Institut für Angewandte Physik, E134
1040 Wien, Wiedner Hauptstraße 8-10
Yellow Tower „B“, 5th floor, SEM.R. DB gelb 05 B

Jan Hulva

TU Wien, Institut für Angewandte Physik

Fe_3O_4 (001) as a model system for single-atom catalysis

The rapidly emerging field of “single-atom catalysis” aims to drastically reduce the amount of precious metal required to catalyze chemical reactions by replacing nanoparticles with single-atom active sites. Although there are now many reports of active single-atom catalysts [1], the concept itself remains controversial because it is challenging to characterize real catalysts and determine the reaction mechanism. In our work, we study fundamental properties of supported single metal atoms using a surface science approach. We employ the Fe_3O_4 (001) surface as a model support, because it can stabilize dense arrays of single metal atoms to temperatures as high as 700 K [2,3].
In this talk, I will present a few examples of $Me_1/Fe_3O_4(001)$ systems and discuss how the coordination of the adatoms influences their adsorption properties. Next, I will focus on the reactivity of the Pt species and show that the $(PtCO)_2$ dimers are active for CO oxidation, in contrast to the inactive adatoms.

[1] – Yang et al., Acc. Chem. Res. 46(2013), pp.1740-1748
[2] – Novotný et al., Phys.Rev.Lett.108(2012): 216103
[3] – Bliem et al., Science 346 (2014): 1215-1218

Jonas Gloss

TU Wien, Institut für Angewandte Physik

Magnetic nanostructures in metastable fcc Fe thin films on Si(100)

It has been shown that 5-10 ML thick Fe films grown on Cu(100) single crystal have an fcc structure and are nonmagnetic at room temperature [1]. Ion-beam irradiation of the fcc films causes a structural transformation from fcc to bcc, as well as a magnetic transformation from non- to ferromagnetic. To remove the 10-ML thickness limit of fcc Fe we alloyed it with 22% of nickel to form a metastable fcc $Fe_{78}Ni_{22}$ [2] and used this system for fabrication of a magnonic crystal [3].
To avoid the costly Cu single crystals, we also grew the films on H-terminated Si(100) with a Cu(100) buffer layer. The H-Si was prepared both in-situ by flashing and deposition of atomic H and ex-situ by etching in HF. The as-grown $Fe_{78}Ni_{22}$ films were corrugated yet metastable; we show they provide the opportunity to write magnetic nanostructures with a focused ion beam [4].

[1] A.Biedermann, et al., Phys. Rev. Lett. 87 (2001) 086103
[2] J. Gloss, et al., Appl. Phys. Lett. 103 (2013) 262405
[3] M. Urbanek, APL Materials 6, (2018) 060701
[4] J. Gloss, et al., Appl. Surf. Sci. *in press* (2018)

All interested colleagues are welcome to this seminar lecture(s) (2 x 20 min. presentations followed by discussion).

Friedrich Aumayr
(LVA-Leiter)

Ulrike Diebold
(Seminar Chair)