# O 103: Oxide and Insulator Surfaces: Structure, Epitaxy and Growth II

Time: Thursday 15:45–16:30 Location: MA 041

O 103.1 Thu 15:45 MA 041

**Germania Ultrathin Films on Different Substrates** — •Adrian L. Lewandowski[1], Philomena Schlexer[2], Christin Büchner[1], Hannah Burrall[3], Kristen M. Burson[3], Wolf-Dieter Schneider[1], Gianfranco Pacchioni[2], Markus Heyde[1], and Hans-Joachim Freund[1] — [1]Fritz-Haber-Institut der Max-Planck-Gesselschaft, Faradayweg 4-6, 14195 Berlin, Germany — [2]Department of Materials Science, Università di Milano-Bicocca, Via R. Cozzi, 55, Milan, Italy — [3]Taylor Science Center, Hamilton College, 198 College Hill Road, Clinton, NY 13323, USA

New insights into the structural configuration of amorphous networks have been obtained after imaging ultrathin silica bilayer films with scanning tunneling microscopy (STM) [1]. In order to establish a general understanding of amorphous networks more structural characterization of glass-former materials, such as germanium oxide, must be done. Germania ultrathin films were grown on Ru(0001) and Pt(111) by physical vapor deposition and subsequent annealing in oxygen. The atomically flat films were characterized by combining intensity-voltage low energy electron diffraction and ab initio density functional theory analysis with high-resolution STM imaging. The film-substrate interaction plays a decisive role in the film structure. On Ru(0001) a crystalline monolayer film with domain boundaries is obtained. At higher coverage disordered phases are revealed. On Pt(111) many different phases can be identified: monolayers with different symmetry, disordered layers at higher coverage and zigzag-line phases.

[1] L. Lichtenstein et al., Angew. Chem. Int. Ed. 51, 404 (2012)

O 103.2 Thu 16:00 MA 041

**High-resolution force mapping on $CaF_2$(111) at 5 K, 77 K, and 300 K in UHV** — •Fabian A. Schlage[1], Matthias Temmen[1], Adam M. Sweetman[2], Philip J. Moriarty[2], Matt Watkins[3], Michael Reichling[1], and Philipp Rahe[1] — [1]Universität Osnabrück, Germany — [2]University of Nottingham, UK — [3]University of Lincoln, UK

Force maps measured on $CaF_2$ (111) allow a detailed analysis of the atomic contrast formation of frequency shift measurements in non-contact atomic force microscopy and especially enable a quantification of interaction forces acting at the different sample sites. 2D force maps taken at room, liquid nitrogen, and liquid helium temperatures are compared. We analyze in detail forces at the atomic scale derived from the frequency shift maps by deconvolution. With these data, we then develop an interpretation for atomic contrast formation beyond the available models that are mainly based on electrostatic interactions.

O 103.3 Thu 16:15 MA 041

**The structure of a two dimensional silica 'zigzag' polymorph on Ruthenium** — •David Kuhness[1], Hyun Jin Yang[1], Hagen Klemm[1], Mauricio Prieto[1], Xin Yu[1], Denis Usvyat[2], Martin Schütz[2], Dietrich Menzel[1], Shamil Shaikhudtinov[1], Thomas Schmidt[1], Markus Heyde[1], Joachim Sauer[2], and Hans-Joachim Freund[1] — [1]Fritz-Haber-Institut der Max-Planck-Gesellschaft, Faradayweg 4-6, 14195 Berlin, Germany — [2]Institut für Chemie, Humboldt-Universität zu Berlin, Brook-Taylor-Str. 2, 12489 Berlin, Germany

Ultrathin two dimensional silica films grown on metal substrates serve as a model system for the study of glass. Its detailed study at the atomic scale allows for insights into its atomic structure, its growth modes, transformations and the herein involved dynamics. We here present a new two dimensional silica polymorph grown on a Ru(0001) metal substrate with characteristic 'zigzag' line structure and rectangular unit cell. Based on scanning tunneling microscopy, low energy electron diffraction, infrared reflection absorption spectroscopy and x-ray photo-electron spectroscopy measurements on the one hand, and density functional theory calculations on the other, a structural model for the 'zigzag' polymorph is proposed. In comparison to established monolayer and bilayer silica, this 'zigzag' structure system has intermediate characteristics in terms of coupling to the substrate and stoichiometry. The silica 'zigzag' phase is transformed upon reoxidation at higher annealing temperature into a $SiO_2$ silica bilayer film which is chemically decoupled from the substrate.