

## DS 32: Metal and Amorphous Layers

Time: Thursday 13:15–14:30

Location: H 2032

DS 32.1 Thu 13:15 H 2032

**Electronic structure of ultrathin lead films** — ●YVONNE KÄSLER, ANDREAS NUBER, FRANK FORSTER, and FRIEDRICH REINERT — Universität Würzburg, Experimentelle Physik II, 97074 Würzburg

We have prepared ultrathin lead films on a Si(111)–(7 × 7) surface using a low temperature growth method, which is necessary to mitigate the problem of a large lattice mismatch and a different chemical bonding of the metal film and the semiconductor. Using high resolution photoelectron spectroscopy we focussed on the observation of quantum well states (QWS) of different film thicknesses. As the formation of QWSs greatly modulates the electronic structure near the Fermi level it has been speculated before that a lot of other properties are modulated as well. One of these is superconductivity. We measured the QWSs at different thicknesses and temperatures, determined the linewidths, and thus we were able to calculate electron-phonon coupling parameters and transition temperatures in dependence of the overlayer thickness. We were able to observe deviations from the bulk values of these parameters.

DS 32.2 Thu 13:30 H 2032

**Infrared spectroscopic study of chromium film growth on single crystal diamond** — ●ROBERT LOVRINCIC and ANNEMARIE PUCCI — Kirchhoff-Institut für Physik der Universität Heidelberg

Detectors made of single crystal diamond are currently being developed for several tasks in particle physics experiments. One important step towards satisfying detector performance is the metallization. As chromium is a carbide forming metal and therefore shows good adhesion to the diamond surface, we studied the system Cr/C(100) by means of infrared spectroscopy under ultra high vacuum conditions. By analysing the obtained spectra with a Drude type dielectric function, we are able to distinguish between different phases in the film growth and to derive information about the electrical conductivity of the metal layer.

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DS 32.3 Thu 13:45 H 2032

**Crystallization kinetics of phase change materials** — ●MICHAEL KLEIN, TOBIAS SONTHEIMER, and MATTHIAS WUTTIG — I. Physikalisches Institut (1A), RWTH Aachen, 52056 Aachen, Germany

Phase change materials are fascinating materials. They can be rapidly switched between two metastable states, the amorphous and crystalline phase, which show pronounced contrast in their optical and electrical properties. They are already widely used as the active layer in rewritable optical media and are expected to be used in the upcoming phase change random access memory (PRAM).

Here we show measurements of the crystallization kinetics of chalcogenide materials that lead to a deeper understanding of these processes.

This work focuses mainly on the Ge-Sb-Te system but also includes Ag-In-Te materials.

The crystallization behaviour of these materials was investigated with an ex-situ annealing method employing the precise oven of a differential scanning calorimeter and imaging techniques employing atomic force microscopy and optical microscopy.

DS 32.4 Thu 14:00 H 2032

**The field dependence of ageing processes: Ion migration in amorphous aluminum and tantalum oxide films after potentiostatic formation** — ●KEVIN STELLA and DETLEF DIESING — Fachbereich Chemie and Centre for Nanointegration (CeNIDE), Universität Duisburg-Essen, D-45117 Essen, Germany

Anodic oxidation of thin aluminum and tantalum films was performed in an electrochemical droplet cell. Thicknesses from 2 up to 8 nm were employed on 10 nm thick aluminum and tantalum films. Under Ultra High Vacuum conditions the conductivity of the remaining metal film is monitored as function of time. Equally prepared oxide films were accomplished in metal-insulator-metal capacitors, which were used to monitor the capacitance as a function of time. The combination of the two experimental setups shows clearly, that small losses in the capacitance of aluminum oxide capacitors are due to slight thickening of the oxide even under vacuum conditions. Up to one monolayer of the base aluminum electrode can be oxidized during  $10^5$  s. Modelling in terms of migration of either oxygen anion interstitials or metal cation migration points preferably to the latter one. Tantalum oxide films of the same thickness show a much larger stability indicating either a lower content of mobile ions or a higher activation barrier for ionisation and migration.

DS 32.5 Thu 14:15 H 2032

**Effect of the Si/SiO<sub>2</sub> interface on oxygen diffusion in SiO<sub>2</sub>** — ●KIRSTEN SUNDER<sup>1</sup>, HARTMUT BRACHT<sup>1</sup>, PETER FIELITZ<sup>2</sup>, and GÜNTER BORCHARDT<sup>2</sup> — <sup>1</sup>Institute of Materials Physics, University of Münster, Germany — <sup>2</sup>Institute of Metallurgy, Clausthal University of Technology, Germany

With down scaling of metal-oxide-semiconductor (MOS) transistors, the influence of the SiO<sub>2</sub>/Si interface on Si and O diffusion in SiO<sub>2</sub> is becoming an important issue. The effect of defects generated at the interface on Si diffusion was investigated intensely by means of isotope heterostructures. It was concluded that SiO generated at the interface diffuses into the oxide and accelerates Si diffusion. The impact of these or different defects on O diffusion was not determined so far.

Performing diffusion experiments with Si<sub>3</sub>N<sub>4</sub>/SiO<sub>2</sub>/<sup>28</sup>Si<sup>18</sup>O<sub>2</sub>/<sup>28</sup>Si isotope heterostructures, that possess different thicknesses of the <sup>28</sup>Si<sup>18</sup>O<sub>2</sub> layer, the influence of the SiO<sub>2</sub>/Si interface on O diffusion in SiO<sub>2</sub> was investigated.