VA 2 Surfaces, instruments and systems

Time: Monday 10:40–12:40 Room: HSZ 101

VA 2.1 Mon 10:40 HSZ 101

Preparation of Heusler alloys – Evaporation chamber design and results — •Andreas Volland and Christian Heyn — Institut für Angewandte Physik, Universität Hamburg, Jungiusstraße 11, 20355 Hamburg

One major challenge for the development of hybrid spintronic devices is the injection of spin-polarized electrons through the interface between the semiconductor material and the metallic ferromagnet. We grow InGaAs based high electron mobility heterostructures with solid-source molecular beam epitaxy. In order to avoid oxidation and contamination of the interface layer between semiconductor heterostructure and ferromagnetic metal contact, it is essential to install the metallization chamber at the vacuum system of the semiconductor growth chamber. In this presentation we show technological aspects of our growth system and first results of Heusler alloy Ni_2MnIn deposition on GaAs and InGaAs surfaces.

VA 2.2 Mon 11:00 HSZ 101

STM study on surface modifications on vacuum fired 304L stainless steel — •Axel Stupnik and Manfred Leisch — Institute for Solid State Physics, Graz University of Technology, Petersgasse 16, 8010 Graz, Austria

In UHV and XHV applications high temperature bakeout (vacuum firing) is a common method to reduce the hydrogen outgassing rate from stainless steel surfaces. This procedure reduces the amount of hydrogen in the bulk. At low bulk concentration hydrogen outgassing is basically limited by surface recombination. The surface of glass bead blasted 304L steel samples was investigated by STM after normal bakeout procedure at 300°C and after vacuum firing at 1000°C. During vacuum firing a complete reconstruction of the surface can be observed. Already after 5 min of vacuum firing the formation of (111) terraces with monoatomic steps can be found. Slightly tilted crystallites exhibit (111) terraces intersected by bunched steps and facets. These facets form a nearly regularly pattern corresponding in orientation almost to the (100) and (110) planes. After 15 min vacuum firing large (111) terraces with extensions up to 200nm intersected by bunched steps can be observed. The general appearance of the surface after vacuum firing indicates a significant reduction of active sites for recombination of hydrogen. This supports the present understanding of outgassing for this material.

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VA 2.3 Mon 11:20 HSZ 101

The Radiation Source ELBE at Forschungszentrum Rossendorf — •Peter Michel — Forschungszentrum Rossendorf, 1314 Dresden, Pf 510119

The radiation source ELBE (Electron Linac of high Brilliance and low Emittance) at Forschungszentrum Rossendorf is based on a superconducting linac that produces a high power continuous wave (cw) electron beam up to 40 MeV and 1 mA. The linac is used to drive two free-electron lasers producing infrared radiation from 5 to 150 microns wavelength. Additionally, from several conversion targets MeV-bremsstrahlung (< 20 MeV) and X-rays (10-100 keV) from electron channelling are generated. In the future even neutron and positron beams will be available at ELBE. The used superconducting RF accelerator technology and details of the machine instrumentation, in particular the electron beam diagnosis will be described.

VA 2.4 Mon 11:40 HSZ 101

Development of a Superconducting RF Photoelectron Injector — •Jochen Teichert — Forschungszentrum Rossendorf, P.O. Box 510119, 01314 Dresden, Germany

A superconducting rf photo electron injector (SRF gun) is under development at the Forschungszentrum Rossendorf. The project aims at several issues: improvement of the beam quality for the ELBE superconducting electron linac, demonstration of feasibility of this gun type, investigation of critical components, and parameter studies for future application (BESSY-FEL, 4GLS). The design layout of the SRF photoinjector, the parameters of the superconducting cavity and the expected electron beam parameters are presented. The SRF gun has a 3+1/2-cell niobium cavity working at 1.3 MHz and will be operated at 2 K. The three full cells have TESLA-like shapes whereas the half-cell has an special form obtained from numerical optimization. In the half-cell a Cs2Te photocathode is situated which will be cooled by liquid nitrogen. In 2005, the main parts for He cryostat like vacuum vessel, cryogenic and magnetic shields were fabricated. Test benches for the cathode cooling system and the cavity tuner were assembled and the measurements performed. The photo cathode preparation lab has been arranged, and the diagnostic beam line has been designed. After delivery of the Nb cavity, its rf properties were measured. The cavity was tuned and its chemical treatment is started.

VA 2.5 Mon 12:00 HSZ 101

Traceability and calibration of the new static expansion system of metas. — •Christian Wuethrich[1] and Moussa Coulibaly[2] — [1]metas, Lindenweg 50, CH-3003 Bern-Wabern — [2]Ecole des mines de Douai, 941 rue Charles Bourseul, BP 838, F-59508 Douai

The pressure laboratory of Metas, the Swiss National Metrological Institute, performed the characterisation and the first calibrations of the new static expansion system MSE1 in 2005. The system consists of 4 expansion stages mounted in cascade and allowing an ultimate calculable pressure of 5*10-6*Pa. The volumetric ratios of the system have been measured using the well known technique of gas accumulation by successive expansion and also with the newly developed technique of gas depletion by successive expansion. The results of the two techniques are equivalent within the uncertainties. The consistency of the pressures generated has been demonstrated by comparison in the range 1*Pa to 1000*Pa with a digital piston manometer. The consistency of the system at lower pressure has been demonstrated by determining the accommodation factor of two spinning rotating gauges over 5 decades of pressure, using two different expansion schemes in the system. The standard deviation of the accommodation factors remains well below the uncertainties.

VA 2.6 Mon 12:20 HSZ 101

Modell zur Beschreibung der Kompression von Wälzkolben-Pumpen — •Gerhard Voss — Leybold Vacuum Köln

Mit einer Methodik, die für die Berechnung der Kompressions-Kurven von Klassischen Turbo-Molekularpumpen entwickelt wurde [G. Voss in Vakuum in Forschung und Praxis 17 (2005) Nr. 6], können auch die Kompressions-Kurven von Wälzkolben-Pumpen berechnet und systematisch analysiert werden. Für die Abhängigkeit des Hochvakuum-Drucks und der Kompression vom Vorvakuum-Druck liefert das Modell einfache analytische Funktionen. Aus den Kompressions-Kurven bei endlichem Gas-Durchsatz (Q > 0) kann die Kompressions-Kurve für Gas-Durchsatz Null gewonnen werden, wobei die Rückförderung der Wälzkolben-Pumpe zu berücksichtigen ist. Der Vergleich mit experimentellen Daten zeigt, dass das vorgestellte Modell eine exzellente qualitative und quantitative Beschreibung der beobachteten Phänomene liefert.