DS 13: Thin Film Analytics II

Time: Tuesday 15:15–16:30 Location: H34

DS 13.1 Tue 15:15 H34

Measurement of oxide layers with laser-assisted atom probe tomography (LA-TAP) — •Christian Oberdorfer[1], Carsten Nowak[2], Christoph Reinke[1], Patrick Stender[1], and Guido Schmitz[1] — [1]Institut für Materialphysik, Universität Münster — [2]Institut für Materialphysik, Universität Göttingen

Conventional atom probes use high voltage pulses of only a few nanoseconds pulse width to trigger the field-evaporation-process. Because of this approach, it is hard to investigate materials of low conductivity. In the past successful measurements of oxide layers where reported only with severe restrictions on the specimen geometry.

Laser-assisted atom probe tomography circumvents this limitation. By using very short laser pulses (< 1 ns) it is now possible to measure oxidic films of a few tens of nanometers in thickness.

The talk will present results obtained with the new atom probe at the university of Münster. Examples of measurements of nickel-oxide and tungsten-oxide will be presented.

DS 13.2 Tue 15:30 H34

Low-level hydrogen profiling with RNRA — •Johannes Bosman, Michael Uhrmacher, Holger Schebela, Carsten Ronning, and Hans Hofsäss — II. Institute of Physics, University of Göttingen, Friedrich-Hund-Platz 1, 37077 Göttingen, Germany

Our intention is to detect hydrogen and its profile in thin films. We will use the resonant nuclear reaction analysis method (RNRA) to achieve this aim, because it is difficult or rather impossible with other methods like RBS, XPS, AES or SIMS. We utilise the nuclear reaction ^{1}H(^{15}N, $\alpha\gamma$)^{12}C, which means, that an accelerator providing a ^{15}N-beam with energies up to 7 MeV is neccessary. The tandem accelerator facility at the II. Institute of Physics includes a so called 'Amsel-deflector' system and a low-level measurement unit, whose combination affords the required non-destructive ion beam method, which enables H-profiling with RNRA. The depth resolution is 2 nm at the surface and 10 nm in the maximum analysing depth of 400 nm. A H-concentration of 450 ppm is detectable using a measuring time of 1 min per energy setting. We analysed ta-C:H layers with a thickness of 100 nm grown by mass separated ion beam deposition (MSIBD) using 100 eV C_2H_2-ions. The optical properties, measured by Raman and FTIR, will be correlated to the H-content. These first experiments and results will be discussed.

DS 13.3 Tue 15:45 H34

High resolution Rutherford backscattering spectrometry for investigating interdiffusion of thin films — •Christian Borschel[1], Martin Schnell[1], Michael Uhrmacher[1], Carsten Ronning[1], Christian Wenger[2], and Hans Hofsäss[1] — [1]II. Physikalisches Institut, Universität Göttingen, Friedrich-Hund-Platz 1, D-37077 Göttingen — [2]IHP microelectronics, Im Technologiepark 25, D-15236 Frankfurt (Oder)

Rutherford backscattering spectrometry (RBS) is a widely used technique to measure concentration-depth profiles of thin films. Usually a semiconductor detector is used to measure the energy of the backscattered ions. The typical energy resolution of 10 to 15 keV of these detectors is the limiting factor for the achievable depth resolution. We use an electrostatical analyzer to measure the energy of the backscattered ions which can improve the energy resolution (and along with that the depth resolution) by a factor of about 10. The enhanced depth resolution makes RBS utilizable to investigate the interdiffusion at the interfaces of thin films. As an example we present experiments on the interdiffusion at the interface of a high-k dielectric Pr_2O_3 film on SiO_2. We show what information about the diffusion of Pr and Si could be extracted from the experimental results and compare the method with other characterization techniques.

DS 13.4 Tue 16:00 H34

Elemental Characterisation of Mn-, Mg- an Co- doped ZnO nanostructures — •Christoph Meinecke, Andreas Rahm, Jürgen Vogt, and Tilman Butz — Universität Leipzig, Fakultät für Physik und Experimentelle Physik II, Linnéstrasse 5, D-04103 Leipzig, Germany

ZnO based nanostructures have attracted increasing interest in recent years due to their structural diversity. Furthermore, transition metal doping (e.g. by Co or Mn) of ZnO films has been shown to create a promising ferromagnetic material for spintronics.

We report on the high-pressure pulsed laser deposition (PLD) growth of zinc oxide nanowires (300 - 500 nm in diameter) containing Co, Mg and Mn grown with NiO and Au catalysts.

Elemental analysis (PIXE, RBS) was carried out using a 2.25 MeV scanning proton beam with a spot size of app. 500 nm. This high spatial resolution at beam currents of app. 100 pA is necessary for the elemental analysis of single nanowires using RBS and PIXE.

Scanning electron microscopy, RBS and Particle induced X-ray emission measurements revealed differences between the compositions of nanowires compared to simultaneously grown films.

DS 13.5 Tue 16:15 H34

The reflectometer ADAM at ILL - Perspectives for an angle dispersive instrument — •Max Wolff, Kyrill Zhernenkov, and Hartmut Zabel — Lehrstuhl für Festkörperphysik/EP IV, Ruhr-Universität Bochum, 44780 Bochum, Germany

The angle dispersive neutron reflectometer ADAM at the ILL offers high flux combined with an excellent Q resolution and full polarization analysis with privileged access for the german user comunity. During the last ten years nearly all components of the instrument have been modified to remain a state-of-the-art instrument. We will give a brief overview on the most recent improvements and most outstanding results obtained during the last years.

To further improve the performance of the instrument we plan to reconstruct the reflectometer. ADAM-2 will again be an angle dispersive reflectometer. The challenging task is to offer both options high resolution and high intensity on a monochromator instrument. To account for this we plan to use an intercalated graphite monocromator in combination with focusing guide elements. In addition the instrument will feature different recent and new developments like, grazing incident small angle scattering, spherical polarisation analysis and pump probe experiments. Combined with an improved infrastructure for sample preparation and environment unique possibilities for the investigations of magnetic thin films, self assembling layers and biological systems will be provided due to the high flux, the low background and excellent polarization analysis.

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