DS 13: Poster Session III: Layer properties: electrical, optical and mechanical properties; Thin film characterization: structure analysis and composition (XRD, TEM; XPS, SIMS, RBS..)

Time: Monday 17:00–20:00 Location: Poster B1

DS 13.1 Mon 17:00 Poster B1

Characterisation of YSZ thin films deposited by RF sputtering — •Daniel Reppin[1], Markus Piechotka[1], Jens Peter Eufinger[2], Benjamin Pachner[1], Angelika Polity[1], Peter J. Klar[1], Bruno K. Meyer[1], and Jürgen Janek[2] — [1]1. Physikalisches Institut, Justus-Liebig-Universität, Heinrich-Buff-Ring 16, 35392 Giessen — [2]Physikalisch-Chemisches Institut, Justus-Liebig-Universität, Heinrich-Buff-Ring 58, 35392 Giessen

Yttria-stabilised zirconia (YSZ) is a technically widely used oxygen ion conductor employed for example in oxygen sensors and solid oxide fuel cells. For these applications the film properties such as the crystal structure and ion conductivity are of major interest. YSZ thin films were deposited from a ceramic target with 9.5 mol% Y_2O_3 by RF sputtering on silicon (004) and fused silica substrats. The films were investigated by 4-circle XRD measurements to determine whether the crystal structure is cubic or tetragonal. Scanning electron microscopy was used to inspect the grain size of the films. Impedance spectroscopy measurements were performed to quantify the oxygen ion conduction.

DS 13.2 Mon 17:00 Poster B1

Doped TiO_2 as alternative transparent conducting oxide — •Daniel Dorow-Gerspach, Philipp Schulte, Patrick Ries, and Matthias Wuttig — I. Physikalisches Institut (IA) RWTH-Aachen University

In many highly demanded modern devices, such as displays and solar cells, materials are needed, that are transparent and at the same time highly conductive. Commonly such materials are called transparent conducing oxides (TCO), with the well-known and efficient but also expensive representative In_2O_3:Sn. A promising cheaper alternative is Niobium doped Titania (TiO_2:Nb), with the matrix material TiO_2 that is already used for anti-reflective coatings or self-cleaning surfaces. For the commercial utilization, there are two challenges. One is the relatively high temperature for the annealing of amorphously deposited TiO_2. The other challenge is that the most conducting films were achieved by RF-sputtering, which is not suitable for large scale production processes. In this work we have used TiO_2 seed layers to reduce the required annealing temperature by 50 K. To address the second point and obtain higher deposition rates, we have employed a reactive DC-sputtering process using a metallic Ti:Nb target. These approaches led to the fabrication of conducting films with a reduced crystallization temperature yet good electronic properties.

DS 13.3 Mon 17:00 Poster B1

Prozess characteristics and film properties upon doping of TiO_2 by reactive serial co-sputtering utilizing high power impuls magnetron sputtering — •Rüdiger M. Schmidt[1], Oliver Lenck[2], Tomas Kubart[3], Dominik Wagner[1], Andreas Pflug[2], Thomas Nyberg[3], Sören Berg[3], and Matthias Wuttig[1] — [1]I. Institute of Physics, RWTH Aachen University, Germany — [2]Fraunhofer IST, Braunschweig, Germany — [3]Solid State Electronics, The Ångström Laboratory, Uppsala University, Sweden

Titanium Dioxide (TiO_2) is a material with attractive properties which have led to various applications such as anti-reflective coatings or self cleaning surfaces. High power impulse magneton sputtering (HiPIMS) is a PVD technique in which the power is applied to the target with low duty cycle (<10%) and frequenzy (<10 kHz) resulting in a high degree of ionization of the sputtered species. As a result, films deposited by HiPIMS show smooth surfaces and high densities. Unfortunatly the deposition of TiO_2 using HiPIMS is hampered by significantly lower deposition rates compared to dcMS. Sputter Yield Amplification (SYA) can be used, through recoil of the sputtering species at implanted heavy dopants below the target surface, to increase deposition rates. We have built a designated sputter deposition tool which enables systematic studies of different dopants. In this study TiO_2 is doped with Tungsten and Tantalum resulting in a rate increase of 250-400% and 180-320% respectively. Optical measurements in the visible range show that the absorption of TiO_2:Ta is less than 0.5%, whereas TiO2:W shows a somewhat higher absorption.

DS 13.4 Mon 17:00 Poster B1

Influence of doping on the metal-semiconductor transition of VO_2 thin films — •Marc K. Dietrich, Angelika Polity, Benedikt Kramm, and Bruno K. Meyer — Justus-Liebig-Universität Gießen, I. Physikalisches Institut, Heinrich-Buff-Ring 16, 35392 Gießen, Germany

The optical and structural properties close to the metal-semiconductor transition of doped vanadium dioxide (VO_2) films have been investigated. Doped VO_2 thin films were deposited by rf sputtering technique on TiO_2 coated glass substrates. Single crystal VO_2 undergoes a phase transition near 68°C, while doping (e.g. fluorine and tungsten) decreases the transition temperature. Therefore, VO_2 has potential for many applications involving thermally activated optical or electronic switching devices. For an application as window coating which switches the transmission dependent on the ambient temperature the determination of luminous transmittance and the g-value are of substantial importance. We determined these properties for the switching in the range of the ambient temperatures.

DS 13.5 Mon 17:00 Poster B1

Optical and magnetotransport properties of ZnO thin films grown by metalorganic aerosol deposition — •Christoph Meyer, Sebastian Hühn, Markus Jungbauer, Markus Michelmann, and Vasily Moshnyaga — I. Physikalisches Institut, Georg-August-Universität Göttingen

ZnO, a II-IV semiconductor with a wide direct bandgap $E_g = 3,4$ eV and a near UV and blue photoluminescence zone, is a promising material for optoelectronic, spintronic and photovoltaic applications, which due to recent successes in nanoscale science, becomes even more attractive today. Therefore a growth control of ZnO thin layers on commercially available substrates as well as a control of doping with n- and p-type dopants or magnetic transition metals is an absolutely necessary task. In this work the photoluminescence and Raman spectroscopies are used to detect and identify typical impurity- and dopant-related optical transitions in ZnO layers, grown by metalorganic aerosol deposition (MAD). The growth conditions (e.g. temperature, deposition rate or precursor molarity) and the substrates (Al_2O_3, MgO buffered Al_2O_3, ZnO) were varied to improve the quality of the layers. Standard sample characterization techniques, e.g. AFM, XRD, SQUID and Hall effect, were used additionally to confirm the quality of the films. XRD reveals c-axis oriented ZnO films on Al_2O_3(0001) substrates. We observed a room temperature photoluminescence caused by exciton transition at $E = 3,288$ eV as well as phonon replica.

DS 13.6 Mon 17:00 Poster B1

Synthesis, microstructure and local electronic conductivity of platinum/titanium oxide contacts — •Marian Bongers, Astrid Pundt und Carsten Nowak — Institut fuer Materialphysik, Friedrich-Hund-Platz 1, 37077 Goettingen, Germany

Pt/TiO_x Schottky contacts are of interest for surface chemical reactions as they allow measuring hot electrons, show catalytic activity and exhibit a change in there electronic characteristics under different chemical ambient. As these effects depend on the crystallographic orientation, a careful characterization of the microstructure is required. Here we present studies on the growth of TiO_2/Pt double layers on MgO <100> single crystals. Layers with several hundred nanometers thickness were prepared by reactive atom beam sputter deposition under O_2 and Xe atmosphere. The layers were structurally characterized by XRD, EBSD and AFM. For optimized synthesis temperature the investigations revealed a preferred <100> orientation of the Pt layer with lateral grain size of the order of 100 μm. For the TiO_2 layers a polycrystalline microstructure was observed. Local I-V-characteristics were measured with conductive AFM and tungsten tips of μm size, revealing rectifying behavior.
Further, investigations on the influence of the deposition temperature and thermal annealing on the quality of the TiO_2 layers are presented. The influence of a chemical gas ambient on the I-V-characteristics of the synthesized Pt/TiO_x contacts will be discussed.
Fincanial support by the DFG via projects PU131/9 and SFB602 is gratefully acknowledged.

DS 13.7 Mon 17:00 Poster B1

Enhanced wear resistance of a rhodium surface by intersti-

tial alloying with boron — •Frank Müller[1], Matthias Lessel[1], Samuel Grandthyll[1], Karin Jacobs[1], Stefan Hüfner[1], Stefan Gsell[2], Michael Weinl[2], and Matthias Schreck[2] — [1]Saarland University, Experimental Physics, 66041 Saarbrücken, Germany — [2]University of Augsburg, Institute of Physics, 86135 Augsburg, Germany

Increasing the wear resistance of a Rh(111) surface can be obtained by ~ 1% alloying with boron atoms via a CVD (Chemical Vapour Deposition) process using trimethylborate, B(OCH3)3, at moderate temperatures of about 800 K. The fragmentation of the precursor molecules on the metal surface results in single boron atoms that are incorporated in the fcc lattice of the substrate, as displayed by X-ray Photoelectron Diffraction (XPD). The boron atoms penetrate into the host lattice up to 100 nm with the boron distribution displaying a nearly homogeneous depth profile, as tested by depth profiling experiments using combined X-ray photoelectron spectroscopy (XPS) and Ar ion etching. When compared to the untreated Rh(111) surface, the wear resistance of the B-"doped" Rh surface is increased to about 400%, as probed by scratching experiments using Atomic Force Microscopy (AFM).

DS 13.8 Mon 17:00 Poster B1

Stress induced wrinkling in laser deposited polymer/metal-nanocomposites — •Anja Westphal, Susanne Schlenkrich, Felix Schlenkrich, Stephanie Demuth, and Hans-Ulrich Krebs — Universität Göttingen, Institut für Materialphysik, Friedrich-Hund-Platz 1, D-37077 Göttingen

Wrinkling of metal surfaces with different periodicities on the nanometer scale can be obtained by pulsed laser deposition (PLD, 248 nm, pulse duration of 30 ns) of polymer/metal bilayers directly after preparation. Systematically, the thickness dependence of the morphology and topography of the wrinkled metal films was analyzed by electron microscopy (SEM) and atomic force microscope (AFM). The characteristic wave lengths were determined by fourier transformation of the AFM surface patterns. Using the beam theory these wavelengths can be related to the tensile moduli of both film components, and the thicknesses of the polymer and metal film, respectively. The early growth stages were also studied by resistance measurements in order to find the transition from isolated metal clusters to closed layers while increasing the amount of metal. The origin of the stress induced wrinkling induced in the metal layers during PLD, the changes in wavelength and a possible application for the measurement of the elastic moduli of thin films will be discussed.

DS 13.9 Mon 17:00 Poster B1

Preparation of equiatomic FeRh thin film by MBE — •Alireza Heidarian[1,2], Kay Potzger[1], Jürgen Lindner[1], and Rantej Bali[1] — [1]HZDR Institute of Ion-Beam Physics and Materials Research P.O. Box 510119, 01314 Dresden, Germany — [2]TU Dresden Helmholtzstr. 10, 01069 Dresden, Germany

High quality equiatomic FeRh thin films with varying thickness have been prepared on MgO (100) substrates via molecular beam epitaxy (MBE). The optimization of the stoichiometry was monitored using XRD, RBS and AES while the magnetic properties were probed in a SQUID. XRD results evidence a well-ordered CsCl-type crystal structure. By increasing the annealing temperature of the films, the structural quality of the films also increase. Moreover, the known first order phase transition at ~350 K from an antiferromagnetic (AF) to a ferromagnetic (FM) state slightly shifts towards higher temperatures. M-H loops of films annealed at 800 °C or 850 °C recorded at 300 K show an opening, which is likely related to the magnetic field-induced AFM-FM phase transition[1]. Residual low-temperature ferromagnetic moments are related to disorder or Fe diffusion towards the interfaces.[1] J. Cao, T. Nam, N. Phuoc and T. Suzuki. J. Appl. Phys 103, 07F501 (2008).

DS 13.10 Mon 17:00 Poster B1

Semiconducting thin films processed at low temperatures from unstabilized ZnO nanoparticle solutions — •Paul Mundt[1], Nicole Anderl[2], and Heinz von Seggern[1] — [1]Electronic Materials Division, Institute of Materials Science, Technische Universität Darmstadt, Petersenstr. 23, 64287 Darmstadt, Germany — [2]Ernst-Berl-Institut für Technische und Makromolekulare Chemie, Technische Universität Darmstadt, Petersenstrasse 22, D-64287 Darmstadt, Germany

Recently, zinc oxide nanoparticles (ZnO-NP) have become a subject of considerable interest due to their properties showing a high potential for developing solution processed, low cost, low temperature semiconducting devices. Most of the work so far uses sterically stabilized ZnO-NP dispersions. However, the stabilizing agents can have a negative impact on the electronic properties of the resulting semiconducting thin film. They act as additional barriers for the charge carriers. Removing these stabilizers from the film usually requires high temperature treatments being not compatible with flexible polymeric substrates. The present work utilizes sol gel processed ZnO-NPs without an additional steric stablization. Thin ZnO-NP films are produced by spin coating and characterized by various techniques to obtain information about the crystallographic structure, the band energies and the topography. Additionally, thin film transistors with a ZnO-NP active layer processed at temperatures of 150°C only and therefore suitable for applications on flexible substrates are realized yielding electron mobilities of 10^{-3}cm^2/Vs.

DS 13.11 Mon 17:00 Poster B1

Epitaxial Fe_3O_4/NiO bilayers grown on MgO(001) — •Tobias Schemme[1], Florian Bertram[2], Karsten Kuepper[1], and Joachim Wollschlaeger[1] — [1]Fachbereich Physik, Universitaet Osnabrueck, Barbarastr. 7, 49076 Osnabrueck — [2]HASYLAB, DESY, Notkestr. 85, 22607 Hamburg

The investigation of magnetic interactions at the interface of thin films is of huge physical and technological interest for instance for the development of magnetoresitive (MR) devices. Epitaxial Fe_3O_4/NiO bilayers were grown on MgO(001) substrates. First, a film of NiO was deposited on the substrate using molecular beam epitaxy (MBE) at 250°C in a 10^{-5} mbar oxygen atmosphere. Afterwards a magnetite film was deposited on the NiO film via reactive MBE at the same temperature. In this study, bilayers with different NiO thicknesses but constant magnetite thickness were investigated. The stoichiometric composition of the oxide films was investigated by X-ray Photoelectron Spectroscopy (XPS), while the thickness and structure were examined by X-ray Diffraction (XRD) and Low Energy Electron Diffraction (LEED), respectively. Structural characterizations indicate a perfect epitaxy of the films. The LEED patterns of the magnetite films show the typical $(\sqrt{2}\times\sqrt{2})$R45° superstructure, while the LEED patterns of the NiO films show the expected (1×1) structure. X-ray Reflectometry (XRR) and XRD measurements were used to quantify the increasing thickness of the NiO films and to validate the crystallinity of the bilayer. The stoichiometric analysis via XPS proofs that the bilayer films consist of stoichiometric Fe_3O_4 and NiO.

DS 13.12 Mon 17:00 Poster B1

Thick manganite films grown by MAD — •F. Fischgrabe[1], E.S. Zhukova[2,3], B. Gorshunov[2,3], M. Dressel[3], and V. Moshnyaga[1] — [1]I. Physikalisches Institut, Universität Göttingen, Germany — [2]Prokhorov General Physics Institute, Russian Academy of Sciences,Moscow, Russia — [3]I. Physikalisches Institut, Universität Stuttgart, German

We report preparation and characterization of $La_{1-x}Ca_xMnO_3$ (LCMO) x=0,3-0,5 films with thickness $1-10\mu m$. Thick epitaxial manganite films could be interesting for THz as well as for far IR Fourier spectroscopy measurements, aimed to study low-energy excitations, like CDW and folding phonons, important for the manganite physics. The samples were grown using metalorganic aerosol deposition (MAD) technique. To verify the film quality XRD, DC and AC resistivity (f=0,1Hz-40MHz; T=5-300K), STM, REM and THz measurements were carried out. $1\mu m$-thick LCMO films with x=1/3 show a metal-insulator transition at T=272 K and residual resistivity, $\rho(5K)\approx 10^{-4}\Omega cm$, i.e. the values characteristic for thin epitaxial LCMO films. XRD measurements demonstrate out-of-plane texture with c=0.3864 nm very close to the bulk value as well as single phase composition. The results show the MAD potential to produce high quality thick oxide films for industrial applications, like coating conductors.

DS 13.13 Mon 17:00 Poster B1

Temperature and time dependent *in-situ* crystallization of strontium titanate thin films — •Florian Hanzig[1], Carsten Richter[1,2], Juliane Hanzig[1], Erik Mehner[1], Hartmut Stöcker[1], Barbara Abendroth[1], and Dirk C. Meyer[1] — [1]TU Bergakademie Freiberg, Institut für Experimentelle Physik — [2]HASYLAB bei DESY, Hamburg

Strontium titanate is a well-known transition metal oxide crystallizing in the perovskite type of structure. With its large band-gap and its mixed ionic and electronic conductivity, $SrTiO_3$ is a promising isolating material in metal-insulator-metal (MIM) structures for resis-

tive switching memories. In this paper, the crystallization of amorphous strontium titanate thin films is investigated by *in-situ* grazing incidence x-ray diffraction using synchrotron light (Beamline E2 at DORIS III - HASYLAB / DESY, Hamburg). We focus on the crystallization mechanisms in dependence of the layer stoichiometry and heating rates. Different physical vapour deposition methods have been used to fabricate stoichiometric and Sr-rich layers. The crystallization and evolution of phase composition, crystallite size and strain of the $SrTiO_3$ layers were investigated for temperatures up to 950 °C under atmospheric conditions. At approximately 350 °C crystallization of the perovskite-type $SrTiO_3$ is initiated for Sr-rich electron beam evaporated layers, whereas stoichiometric sputter deposited thin films crystallize from about 500 °C. During annealing a diffusion of Si from the substrate into the $SrTiO_3$ layer occur leading to the formation of secondary silicate phases which are detected by XPS.

DS 13.14 Mon 17:00 Poster B1

Bayesian Fitting of Neutron and X-Ray Reflectivity Data — •Jean-Francois Moulin, Martin Haese-Seiller, and Andreas Schreyer — Helmholtz-Zentrum Geesthacht Boltzmann Strasse 1 21502 Geesthacht Germany

Deducing the structure of thin films by analysis of the X-ray or neutron reflectivity curves often proves to be challenging. The inversion problem does not have a unique solution and the $\chi 2$ landscape which has to be searched for a global minimum is often very unfavorable to the use of standard techniques such as the Levenberg-Marquardt algorithm. It is well known that human guidance is often required in order to start the search with a parameter set which is already very close to the real solution. In the quest for better fitting methodologies many efforts have been devoted to techniques which garantee that the algorithm does not get stuck in local minima. Notable examples are genetic algorithms, particle swarm optimisation and Bayesian analysis. Bayesian optimization makes use of a Monte Carlo exploration of the $\chi 2$ landscape and eventually leads to a description of the parameters corelations and the distributions of their values. In the Bayesian framework one encodes all a priori knowledge about the experiment and then extracts from the posterior data a quantitative information about what we can learn from the experimental observation. In this paper we will show how one can take advantage of the Bayesian optimization methods to charachterize thin films and we will demonstrate the use of readily available open source libraries to build an efficient and reconfigurable toolbox which can tackle a variety of problems.

DS 13.15 Mon 17:00 Poster B1

Laser-induced phase transitions in PLD-deposited Ge2Sb2Te5-films using single nanosecond UV-pulses — •Erik Thelander[1], Hongbing Lu[1,2], Ulrich Ross[1], Jürgen Gerlach[1], and Bernd Rauschenabch[1] — [1]Institute of Surface Modification, Leipzig, Germany — [2]Hubei University, Wuhan, China

Phase transformations between amorphous and metastable crystalline state were induced by irradiation with a 248 nm single nanosecond pulse in films grown with pulsed laser deposition. By adjusting the laser fluence, the two different phases were obtained and could be distinguished by differences in optical reflectivity. Detailed structural analysis was carried out with XRD and HRTEM to elucidate the effect of laser fluence on the crystalline nature of the samples. Large structural differences between laser-annealed and thermally annealed films were revealed, in terms of lattice constant expansion and grain size evolution. This is believed to originate from the fast heating rate and short duration of the laser pulse. X-ray reflectivity measurements showed a 3.58 % densification upon laser-induced crystallization.

DS 13.16 Mon 17:00 Poster B1

Microstructural investigation of epitaxial grown GaN thin films using hyperthermal ions — •David Poppitz, Andriy Lotnyk, Jürgen W. Gerlach, and Bernd Rauschenbach — Leibniz-Institut für Oberflächenmodifizierung e. V., Permoserstr. 15, D-04318 Leipzig

Gallium nitride thin films grown with ion beam assisted molecular beam epitaxy on different substrates and at different growth parameters are studied by using (S)TEM imaging and chemical analysis. The aim of this study is to get information about the interface between gallium nitride film and the substrate materials using high resolution TEM. The gallium nitride thin films were grown on 6H-SiC(0001) and Al2O3(0001) substrates without using buffer layers. The influence of the substrate temperature in the range from 630 °C to 750 °C and the nitrogen ion/gallium flux ratio on the growth process is investigated. The aim was to examine the defect structure of the films with a high resolution Cs-corrected analytical TEM. To get high resolution pictures sensitive and sophisticated preparation methods were used and optimized relating to the material system. TEM lamellae were sliced by using focused ion beam technique and afterwards the samples were thinned by ultra-low energy argon ion polishing. In this process amorphous layers and gallium implementations from the cutting process with high energetic gallium ions were removed. Very thin sample thicknesses of a few nanometers have been achieved and high resolution (S)TEM images could be taken. Further chemical analysis at the nanometer scale by using EDX- and EELS- measurements were done.

DS 13.17 Mon 17:00 Poster B1

Quantitative investigation of laser-deposited Ge2Sb2Te5 by abberation corrected STEM/EELS — •Ulrich Ross, Andriy Lotnyk, Erik Thelander, and Bernd Rauschenbach — Leibniz-Institut für Oberflächenmodifizierung e.V. Permoserstr. 15 D-04318 Leipzig

We have investigated amorphous as well as crystalline Ge2Sb2Te5 thin films grown by pulsed laser deposition onto various substrates, utilizing the capabilities of an analytical TEM (Titan 80-300kV Cs probe corrected) in conjuncture with a post-column EELS spectrometer. The material system Ge2S2bTe5 (GST) is of special interest as a test-case for phase-change behaviour materials. As such, we have investigated both as-deposited as well as recrystallized thin-film samples in regards to local composition, local crystallinity and crystal structure. In addition, we aim to make use of the excellent spacial and energy resolution of the Cs-corrected STEM-EELS in order to correlate local composition with changes in the conduction behaviour characteristic for phase-change materials. Preliminary results will be presented, illustrating quantitative high-resolution STEM as a promising approach to futher understanding of the physical phenomena behind phase-change behaviour.

DS 13.18 Mon 17:00 Poster B1

Epitaxy of Ultrathin Metal Films for Ultrafast Electron Diffraction and Plasmonics — •T. Becker, S. Meyer, T. Payer, F.-J. Meyer zu Heringdorf, and M. Horn-von Hoegen — University Duisburg-Essen, Duisburg, Germany

Monocrystalline metal films on halogenide salt substrates and mica were epitaxially grown to produce electron transparent, free-standing membranes with few 10 nm thickness for ultrafast transmission electron diffraction respectively thicker films for use in plasmonic excitation. Au, Co and Fe films with various thicknesses from 20 nm to 100 nm were deposited under UHV conditions by molecular beam epitaxy in a temperature range from -100 °C to 470 °C on clean and atomically plain NaCl or KCl substrates that were prepared as described in [1]. The mica substrates were cleaved. The morphology was examined using in-situ LEED and ex-situ AFM. Cobalt forms 3D islands in the μm-regime. Continuous iron films with a rms surface roughness of less than 1 nm were obtained after annealing at 330 °C for one hour. For Au on KCl another type of growth was observed. In the whole temperature range 3D islands with different diameters and heights up to 140 nm are dominating the surface structure. To obtain closed monocrystalline Au films with rms surface roughness below 1 nm, Au was deposited at 250 °C on a mica substrate.

[1] T.Payer et al., Appl. Phys. Lett. 93, 093102 (2008)

DS 13.19 Mon 17:00 Poster B1

Formation of ZnO layers by spraying Zn(acac)2 and [Zn(O2C(CH2OCH2)3H)2] precursors from solution — •Iulia G. Toader[1], Falko Seidel[1], Philipp Schäfer[1], Ovidiu D. Gordan[1], Alexander Jakob[2], Stefan Möckel[2], Heinrich Lang[2], Michael Hietschold[3], and Dietrich R. T. Zahn[1] — [1]Semiconductor Physics, Chemnitz University of Technology, D-09107 Chemnitz, Germany — [2]Inorganic Chemistry, Chemnitz University of Technology, D-09111 Chemnitz, Germany — [3]Solid Surfaces Analysis Group, Chemnitz University of Technology, D-09107 Chemnitz, Germany

Due to its transparency and wide band gap ZnO represents a suitable material for future transparent electronics. In this work, two ZnO precursors namely zinc acetylacetonate hydrate (Zn(acac)2) and zinc(II)-[2-(2-methoxyethoxy)ethoxy]acetate ([Zn(O2C(CH2OCH2)3H)2]) were sprayed from solution. A post annealing treatment was applied on the as-sprayed films which led to the formation of ZnO layers. Their investigation was performed us-

ing infrared and Raman spectroscopies, scanning electron microscopy, and energy dispersive X-ray spectroscopy. By varying parameters such as the heating temperature and the time interval during heating, the quality of the ZnO layers formed could be tested and improved. It was therefore proven that not only the temperature but most importantly the heating time play an important role in achieving high quality ZnO layers. Moreover, it was shown that for the two precursors the same heating treatment leads to completely different film morphologies.

DS 13.20 Mon 17:00 Poster B1

Photoemission Analysis of PLD grown Oxide Heterointerfaces — •Uwe Treske, Andreas Koitzsch, Martin Knupfer, and Bernd Büchner — Institute for Solid State Research, IFW-Dresden, P.O.Box 270116, D-01171 Dresden, Germany

Pulsed laser deposition enables monolayer controlled growth of transition metal oxide heterointerfaces with a variety of exotic phenomena depending on the growth conditions. A prominent example is the formation of a high-mobility two-dimensional electron gas at the interface of $LaAlO_3$ grown on TiO_2-terminated $SrTiO_3$ substrates. The origin of conductivity at the interface of such insulating oxides is still under discussion. The polar catastrophe, oxygen vacancies and also cation intermixing should be taken into account. We apply soft x-ray photoemission studies to investigate stoichiometric aspects as well as in-gap states and differences in the core levels depending on the layer thickness.

DS 13.21 Mon 17:00 Poster B1

Direct observation of deuterium-dead layer in Fe/V multilayers by atom probe tomography — •Ryota Gemma[1,2], Talaat Al-Kassab[2], Reiner Kirchheim[1], and Astrid Pundt[1] — [1]Institute of Materials Physics, University of Göttingen, Friedrich-Hund-Platz 1, D-37077 Göttingen, Germany — [2]Physical Science and Engineering Division, King Abdullah University of Science and Technology (KAUST), Thuwal 23955-6900, Kingdom of Saudi Arabia

Atom probe tomography (APT) is nowadays regarded as one of the promising tools to analyze hydrogen or deuterium (D) distributions on the atomic scale. At metallic hetero-interfaces, it has been suggested that a nanometer thin hydrogen-dead layer (DL) appears due to an interface charge transfer and/or to an elastic discontinuity. With focus on such an interface effect, we investigated the local deuterium distribution in multilayered thin Fe/V films by APT. More recently, we have succeeded to observe DL by APT. In this contribution, we report on detailed studies on DL: The DL in Fe/V multilayers can be successfully separated from an interface mixing effect. The observed DL thickness commonly ranges from 0.4 to 0.5 nm, showing an excellent agreement with the previously suggested DL thickness. But, the DL is found to disappear at high deuterium concentrations above 0.1 D/Metal. This is considered to originate from occupation of high energy interstitial sites by D atoms, at the interface. A sloped plateau region as found in the corresponding p-c-T diagram, supports this interpretation. Financial support by the DFG via project PU131/9 is gratefully acknowledged.

DS 13.22 Mon 17:00 Poster B1

Construction of a multichromatic dual-beam magnetometer using a triaxial magnetic field based on the magnetooptic Kerr effect — •Gerhard Götz, Timo Kuschel, and Günter Reiss — University of Bielefeld, Germany

In this work we present the construction and optimization of a home-built magnetometer for investigations of the magnetic properties of thin films via the magnetooptic Kerr-Effect (MOKE). Based on a dual-beam system the polar MOKE as well as the quadratic MOKE can be measured seperately without contribution of the longitudinal MOKE using perpendicular incidence. The magnetic field can be applied in three dimensions to magnetize samples with in-plane or out-of-plane magnetization. The sample can be rotated around the sample normal to examine its in-plane anisotropy. Also the magnetization reversal process of in-plane and out-of-plane magnetized samples can be reconstructed and characterized by vectorial magnetometry via MOKE measurements using s- and p-polarized incident light and different magnetic field directions. Four laser diodes are used to study the linear and the quadratic MOKE spectrally using different wavelengths for the incident light in the visible range.

All this measurement modi are demonstrated in this work using Permalloy, Fe_3O_4 and $(CoFe)_{77}Tb_{23}$ thin films.