was observed at different critical metal concentrations ranging from 15 to 40 vol. %. It is demonstrated also that the optical, electrical and chemical properties may be varied widely close to percolation. Thus the index of refraction can be tuned over a wide range and surface plasmons, occurring for noble metals in the visible range, can be shifted to the infrared region. MPNF chemical sensors are based on the swelling of the polymer matix in the presence of organic vapors. Moreover, new polymer-metal composites with photochromic properties will be presented.

DS 29.6 Thu 19:15 H 2013

Electrical characterization of conducting ion tracks in insulating tetrahedral amorphous carbon — •Hans-Gregor Gehrke[1], Anne-Katrin Nix[1], Johann Krauser[2], Christina Trautmann[3], and Hans Hofsäss[1] — [1]II. Physikalisches Institut Göttingen, Germany — [2]Hochschule Harz, Wernigerode, Germany — [3]Gesellschaft für Schwerionenforschung, Darmstadt, Germany

We investigated the formation and the electrical characteristics of quasi one-dimensional conducting tracks in tetrahedral amorphous carbon (ta-C) produced by swift heavy ion irradiation. The ta-C films with thicknesses of about 100 nm were created with mass-separated ion beam deposition (MSIBD) on highly conducting silicon substrates with a deposition energy of 100 eV yielding into a sp^3 bond fraction of approximately 80%. The films were irradiated afterwards with 1 GeV ^{238}U ions with fluences between 10^8 and 10^{11} ions/cm^2. The high electronic energy loss of about 30 keV/nm of the swift heavy ions graphitizes the film locally along the ion trajectory. Thus, conducting nanowires embedded in an insulating matrix were achieved. The presence of the tracks could be confirmed with atomic force microscopy (AFM) using a conducting cantilever and applying a bias voltage. The conductance of the tracks is several orders of magnitude higher than that of the surrounding matrix. Temperature depended electrical characterization (300 K - 15 K) were performed on track ensembles with special focus on improving the contact pads.

DS 30: Layer Properties: Electrical, Optical and Mechanical Properties

Time: Thursday 9:30–11:00 Location: H 2032

DS 30.1 Thu 9:30 H 2032

Spectral ellipsometry of embedded VO_2 nanoclusters in SiO_2 during the semiconductor-metal transition — Helmut Karl, •Anne-Kathrin Jambreck, and Bernd Stritzker — Institut für Physik, Universität Augsburg, D-86135 Augsburg

Vanadium dioxide exhibits a semiconductor-metal transition at 68°C. We have synthesized VO_2 nanoclusters embedded in 200 nm thick thermally grown SiO_2 on 4-inch silicon wafers by ion implantation. The elements V and O were implanted with an energy of 100 keV and 36 keV respectively in order to place the maximum concentration to a depth of approximately 100 nm in the SiO_2 thin film. The fluences of V and O were varied between 10^{17} and $4x10^{16}\frac{at.}{cm^2}$ in order to achieve different V to O ratios and concentrations by a combinatorial ion implantation technique. After the implantation process the formation of the VO_2 nanoclusters was obtained by an annealing step in a rapid thermal processor in flowing Ar at 1000°C for 10 min. The formation of VO_2 precipitates was verified by Raman spectroscopy and x-ray diffractometry. The temperature dependent optical properties of the thin films were analysed by ellipsometry in the spectral range of 320 to 1700 nm. It was found, that the hysteresis of the optical parameters during the semiconductor-metal transition like refraction index n and extinction coefficient k as a function of temperature is much larger than that observed for VO_2 single crystals and thin films.

DS 30.2 Thu 9:45 H 2032

Stress-engineering and optical properties of SiO_2 and TiO_2 thin films grown by dual ion beam deposition — •Carsten Bundesmann, Inga-Maria Eichentopf, Stephan Mändl, and Horst Neumann — Leibniz-Institut für Oberflächenmodifizierung e.V., Permoserstr. 15, 04318 Leipzig

Reduced stress in thin films is a key issue for advanced optical applications, for instance, micro-mirrors. We present results on the influence of additional ion bombardment during growth on the layer stress and optical properties of SiO_2 and TiO_2 thin films. The thin films are grown by reactive dual ion beam deposition [1]. One ion beam source (sputter source) is used to sputter a target. An additional ion source (assist source) is used to bombard the film during growth. Thereupon, a non-thermal energy contribution is introduced into the top few monolayers, which can be used to tailor thin film properties, for instance, the layer stress [2]. Hence, layer stress and optical properties are investigated depending on the parameters of the sputter and assist source. It is found that the layer stress can be reduced by additional ion bombardment. The most important parameter is the ion energy of the assist source, whereas ion species and ion current have only a minor effect. The refractive index of the thin films changes only slightly and no absorption is introduced upon ion bombardment, which makes these thin films promising candidates for optical applications.

[1] C. Bundesmann, I.-M. Eichentopf, S. Mändl, H. Neumann, in submission.

[2] C. A. Davis, Thin Solid Films 226, 30-34 (1993).

DS 30.3 Thu 10:00 H 2032

Charge transport in nanoparticulate Zinc Oxide layers — •Simon Bubel[1], Donna Nikolova[1], Koshi Okamura[1], Norman Mechau[1], Roland Schmechel[2], and Horst Hahn[1] — [1]Forschungszentrum Karlsruhe, Institute of Nanotechnology — [2]Universität Duisburg-Essen, Institute for Nano Structures and Technology

The electrical characteristics of thin layers of nanoparticulate zinc oxide (*NP*-ZnO) were investigated by four-point–, current-voltage measurements and transient current experiments. Layers have been spincoated from dispersion of *NP*-ZnO in isopropanol (iPrOH). The current injection from thermal evaporated metal electrodes of gold and aluminium was found to be ohmic. Accordingly, the influence of electrodes to the considered electrical characteristics of the nanoparticulate thin film could be neglected which enabled the application of space-charge limited current models. Therefore the potential gradient in the sample has been calculated and fitted to experimental data. The electrical properties observed were found in close agreement with the theory of traps distributed in energy.

DS 30.4 Thu 10:15 H 2032

Simulations on Grazing-Incidence Reflectometry in the XUV for Thin Film Structures — •Matus Banyay and Larissa Juschkin — RWTH Aachen - Department of Optical System Technology

Grazing-incidence reflectometry using extreme-ultraviolet light (XUV) of 4-40 *nm* enables to characterize thin film structures on the nanometer scale. Composition, thickness and surface roughness of a deposited layer system can be determined indirectly from its reflectivity curve by non-linear regression techniques and the combined Nevot Croce[1]- and general transfer-matrix formalism[2] for X-ray reflectivity. Here the reflectivity can either be determined as a function of incident wavelength at a fixed grazing angle or vice versa. This way it is even possible to specify a root-mean-square (rms) surface roughness of hidden layer-interfaces in the depth of a stack. We present our simulations on thin-film structures and materials that are of importance in XUV applications, e.g. Si, SiO_2, Zn, C, Mo, Ag. Results show that the amount of noise in the reflectivity curve imposes a boundary on the fitting precision. First data from laboratory based XUV-reflectometers is used to determine different layer-structures. Simulations on more complex systems (>10 layers) are planned. The results will help to estimate the possibilities of our planned experimental setup (supported by BMWi-InnoNet) that will be presented at the end of the talk while the main focus lies on the simulations.

[1] L. Nevot, P. Croce, Rev. Phys. Appl. 15, 761 (1980); [2] A. Gibaud, S. Hazra, Curr Sci., 78, 12 (2000);

DS 30.5 Thu 10:30 H 2032

Co-deposition of energetic carbon and Copper ions: Self-organization of multilayers — •Hayo Zutz[1], Dominika Lyzwa[1], Inga Gerhards[1], Carsten Ronning[1], Michael Seibt[2], and Hans Hofsäss[1] — [1]II. Physikalisches Institut, Universität Göttingen, Friedich-Hund-Platz 1, 37077 Göttingen — [2]IV. Physikalisches Insti-