work, we applied a vapor phase tandem deposition method to generate polymer-metal nanocomposites. We observed core-shell type structures after tandem deposition of Au and Ag on polystyrene. Thermal annealing of these led to SPR shift due to alloy formation. We also produced sandwich structures consisting of nanoclusters of different metals separated by a thin polymer barrier. By tailoring parameters like metallic concentration and by sandwiching the Au/Ag particles between polymer with different thickness, the multiple plasmon resonances can be tuned over a wide visible wavelength range.

DS 24.21 Tue 15:00 P2

Optical and electrical detection of hydrogen at room temperature based on MgNi switchable mirrors — •Baker Farangis, Jennifer Stiebich, Bruno K. Meyer, and Dietmar Hasselkamp — I. Physikalisches Institut, Justus Liebig Universität, Heinrich Buff Ring 16, 35392 Giessen

Metallic films of MgNi including a thin palladium cap-layer prepared by RF sputtering exhibit a reversible switching behavior from a highly reflecting to a transmitting state upon hydrogenation and dehydrogenation. The principle of a switchable mirror can be used in an optical sensor to detect hydrogen gas. It bases on a reversible metal-insulator-transition (MIT) upon hydrogen absorption. The MIT also changes the electrical conductivity, therefore in an electrical sensor, the change in conductivity can be used for hydrogen detection. The signal intensity before and after hydrogen take up (4% H_2 in Argon and at room temperature) is stable, and the hydrogen absorption is a fast process. It reaches for the optical sensor within 10 seconds 90% of the maximum value (t_{90}), and for the electrical sensor it is 1 second, considerably faster. The sensitivity of the sensors as a function of the hydrogen concentration was investigated (1-4% H_2 in Ar) and shows an exponential connection.

DS 24.22 Tue 15:00 P2

Electrical and optical properties of electrodeposited Cr ultra-thin films on Si (100) substrate — •Violeta Georgescu and Cristina Sirbu — Faculty of Physics, Al. I. Cuza University, Iasi, Romania

Electronic transport properties of ultra-thin films and of nanometer-sized crystallites of metals deposited onto semiconductors play an important role for the development of nanoscaled electronic devices. In this work, we report the electrical and optical properties of ultra-thin films (2 nm * 50 nm) composed of Cr nano-crystal electrodeposited onto silicon single crystal. The films were prepared by electrodeposition from a solution based on CrO_3 under potentiostatic conditions. Atomic force microscopy has been employed to investigate the morphology of ultra-thin films and the distribution of the Cr nano-crystals grown by this method on n-type Si (100) substrate P-doped. Reflection spectra for ultra-thin Cr/Si films with various thicknesses were recorded in the photon energy range 1.18*3.1eV using a computer controlled STEAG-ETA Optic Spectrometer. Electronic transport behavior performed at room temperature in the plane of the films revealed the type of electrical conduction. Analysis of photo-resistance for various samples allows us to detect the onset of metallic conductivity due to percolation of island-like Cr metal films onto semiconductor substrate. In the case of very small Cr nano-crystals one can observe specific quantum size effects

DS 24.23 Tue 15:00 P2

Annealing effects on VO_2 thin films deposited by reactive sputtering — •Ganhua Fu, Angelika Polity, Niklas Volbers, and Bruno K. Meyer — I. Physikalisches Institut, Justus-Liebig-Universität Giessen, Heinrich-Buff-Ring 16, D-35392, Giessen

Due to the switching of the optical properties at semiconductor-metal phase transition, VO_2 can be used as infra-red light (IR)-switching or bolometric devices or as intelligent energy conserving window coating. In this work, two VO_2 film systems (bare VO_2 film on float glass and W doped VO_2 film with a TiO_2 capping layer) were deposited by radio-frequency reactive sputtering. Their thermal stability was investigated by annealing the films in air at different temperatures. It was found that the VO_2 thin film is quite stable in air below 200 °C. However, after annealing in air at 300 °C, the pure VO_2 film was oxidized to a V_2O_5 film. The W doped VO_2 layer with a TiO_2 capping layer lost its switching property after annealing at 400 °C for 10 min due to inter-diffusion.

DS 24.24 Tue 15:00 P2

Indentation and shear of thin fluorocarbon films on silicon substrate — •Yonghe Liu, Mikhail Kosinskiy, Vasil Yanev, Stefan Krischok, and Juergen A. Schaefer — Institut für Physik und Zentrum für Mikro- und Nanotechnologien, Technische Universität Ilmenau, 98693 Ilmenau, Germany

Deposition of a thin polytetrafluoroethylene-like fluorocarbon (FC) film on Si can reduce its adhesion to various substances including water significantly, and thus has potential applications in microelectromechanical systems. However, the adhesion of FC on Si substrate is also weak, which might lead to debonding and other damages of the films under both compression and shear. We report the indentation and shear behaviour of FC films with various thickness prepared by plasma enhanced polymerization. The measurements were performed by a microtribometer with a sphere-on-plane setup. A prescribed load was applied to a glass cantilever through which an atomically smooth Si sphere was in contact with a Si specimen covered with FC film. The normal load-displacement curves in loading and unloading were employed to study the indentation behaviour. Lateral force measured at various normal loads and strain rates were analyzed with contact models to study the shear properties. The topography of residual impression and the wear scars left by shear deformation were observed by a confocal scanning laser microscope and correlated with the indentation and shear measurements.

DS 24.25 Tue 15:00 P2

Parameter screening for the chemical vapour deposition of BN films in the system B-N-H-F — •Jens Matheis, Dimitrios Sapounas, and Achim Lunk — Institute for Plasma Research, University of Stuttgart, Pfaffenwaldring 31, 70569 Stuttgart, Germany

Cubic boron nitride (c-BN) is still an interesting material for protection layers as well as for applications in electronics. Up to now, a lot of different approaches where made to deposit c-BN layers in a μm range without internal stress. Mostly depositions were realized by plasma enhanced physical vapour deposition (PEPVD), using high energy ion bombardment. The stress can be reduced by lowering ion energy in com-bination with plasma enhanced chemical vapour deposition (PECVD). For the application of PECVD we have performed a parameter screening, varying the gas mixtures and the fluxes in the system B-N-H-F for BN-deposition.

Equilibrium state calculations were performed with different gas mixtures of the B-N-H-F-system. The programs CEA and KINTECUS were applied. Also the system Ar-BF_3-N_2-H_2 was calculated for comparison with data from literature. The results achieved in the system BF_3-N_2-H_2 show a good agreement with those obtained by EKVICALC.

For different gas mixtures we present and discuss the parameter ranges where deposition of BN is possible up to temperatures of 1500 K. We found that the relations of B to F as well F to H are crucial parameters for the BN formation. In a further step results will be presented of calculations outside of the thermodynamical equilibrium, including surface reactions and plasma stimulated reactions.

DS 24.26 Tue 15:00 P2

Substrate Temperature Control for Diamond Film Deposition — •Nicolas Wöhrl, Markus Degenhardt, and Volker Buck — Thin Film Technology Group, Dept. of Physics, University of Duisburg-Essen, Universitätsstr. 3-5, 45141 Essen, Germany

The substrate temperature is a critical process parameter for the deposition of diamond. A temperature above 500°C is needed for a reasonable deposition rate and should not extend 1300°C because above this temperature the films become more and more graphitic. Also the film properties are affected by the deposition temperature (e.g. morphology or residual stress).

Another important aspect of the diamond deposition is that the deposition rate of diamond films is scaling with the power used for the plasma. From this results that for high deposition rate the substrate must be cooled (For usual deposition rates mainly self-heating or even external heating are common). Therefore the control of the substrate temperature and an effective substrate cooling is crucial for the understanding of the deposition process and a high rate deposition of diamond.

Thus an aerosol water cooling of the substrate holder was build to meet the needs of the diamond deposition. The setup uses an IR-pyrometer to measure the substrate temperature.

The nanocrystalline diamond films shown in this work were deposited at different substrate temperatures from an Ar/H_2/CH_4 plasma in a MW-CVD plasma chamber. The performance of the aerosol water cooling and the influence of the substrate temperature on the film properties are shown.