thermodynamic equilibrium. Results of kinetic and equilibrium modeling show that the range where BN can be deposited is very sensitive to the mole fraction of the species X which is used. Using oxygen as well as fluorine there exist only few parameter compositions to deposit BN. These parameter sets are very important in relation to possible etching effects in PECVD of c-BN deposition.

DS 9.4 Mon 16:00 H34

Correlation of structural properties of DLC films to their mechanical and optical properties — •Oleksiy Filipov, Alexei Poukhovoi, Nicolas Woehrl, and Volker Buck — Thin Film Technology Group, Dept. of Physics, University of Duisburg-Essen, Universitätsstr. 3-5, 45141 Essen, Germany

Diamond-like carbon films refers to a form of amorphous carbon a-C and hydrogenated amorphous carbon a-C:H containing a sizeable fraction of sp3 bonding, which makes them mechanically hard, infrared transparent and chemically inert. But DLC films have a big drawback high residual stress. In order to adjust stress and investigate properties of deposited films, DLC films were deposited onto different types of substrates like glass to investigate optical properties, Si and steel to investigate structural and mechanical properties, by using different deposition methods such as PVD DC-anodic arc and CVD RF-plasma. Both deposition methods allow us independently adjust substrate bias and gas admixture in order to influence the film properties. The structural properties of the films were characterized by Raman and FTIR spectroscopies. The optical properties of the films were ex-situ examined by UV-IR spectroscopy. The intrinsic stress was measured ex-situ by determining the substrate curvature using SSIOD method. It was shown correlation between structural and optical properties of deposited films and influence of deposition parameters onto intrinsic stress. The influence of hydrogen flow rate on film properties was also shown.

DS 9.5 Mon 16:15 H34

Electronic properties of graphite-like ion tracks in insulating tetrahedral amorphous carbon — Anne-Katrin Nix[1], Daniel Schwen[1], Carsten Ronning[1], Johann Krauser[2], Christina Trautmann[3], and •Hans Hofsäss[1] — [1]II. Physikalisches Institut, Universität Göttingen, Friedrich-Hund-Platz 1, 37077 Göttingen, Germany — [2]Hochschule Harz, Friedrichstrasse 57-59, 38855 Wernigerode, Germany — [3]Gesellschaft für Schwerionenforschung, Planckstrasse 1, 64291 Darmstadt, Germany

We investigated the formation of quasi one-dimensional conducting filaments in diamond like carbon (DLC) films created by swift heavy ion irradiation. Various DLC films with thicknesses of about 100 nm were grown using mass separated ion beam deposition (MSIBD) on highly conducting Si and Ni substrates. After deposition the films were irradiated with 1 GeV ^{238}U ions with fluences between 10^9 and 10^{11} ions/cm^2. Due to their high electronic energy loss of about 30 keV/nm the swift heavy ions graphitize the predominantly (80 %) sp^3-bound carbon film along their trajectories yielding conducting nanowires embedded in an insulating matrix. Using atomic force microscopy (AFM) with conducting cantilevers and applied bias voltage the presence of conducting tracks was confirmed and their conductivities were determined to be several orders of magnitude higher than of the host matrix. Temperature dependent electrical measurements were performed on the irradiated samples at 300 K - 10 K with fields up to 5 V/μm. We will discuss the results with respect to contact resistances and possible one-dimensional conduction mechanisms within the tracks.

DS 9.6 Mon 16:30 H34

Synthesis of MAX Functional Coatings by PLD — •Peter Schaaf[1], Christian Lange[1], Salvatore Cusenza[1], and Michel Barsoum[2] — [1]Universität Göttingen, II.Physikalisches Institut, Friedrich-Hund-Platz 1, 37077 Göttingen, Germany — [2]Drexel University, Department of Materials Science and Engineering, Philadelphia, PA, USA

MAX phases - short for $M_{n+1}AX_n$ - constitute an exciting new class of materials. The prototype of this material class, Ti_3SiC_2, was first discovered and characterized in 1967 [1], but only in 1996 it was discovered that this material is stiff, lightweight, machinable, made from relatively inexpensive raw materials, resistant to oxidation and thermal shock, and capable of remaining strong up to temperatures in excess of 1300°C in air [2,3]. Since then, many MAX phases have been synthesized and characterized and first industrial applications occur [3]. Nevertheless, the potential of this material as a protective coating is not yet exploited. We report on experiments on the deposition of MAX coatings by PLD. The films were deposited at increasing substrate temperatures and subsequently analyzed by a variety of methods. Results on MAX coatings in the Ti-Si-C and the Ti-Al-N regime are reported.
[1] W Jeitschko and H Nowotny. 1967. Monatschrift für Chemie 98:329-337.
[2] MW Barsoum and T El-Raghy. 1996. Journal of the American Ceramic Society 79:1953-1956.
[3] MW Barsoum and T El-Raghy, American Scientist 89, 334 (2001).

DS 9.7 Mon 16:45 H34

An empirical bond-order potential for simulating amorphous (hydro)carbon film formation — •Lars Pastewka[1] and Michael Moseler[1,2] — [1]Fraunhofer Institut Werkstoffmechanik, Wöhlerstraße 11, 79108 Freiburg — [2]Freiburger Materialforschungszentrum, Stefan-Meier-Straße 21, 79104 Freiburg

Process simulation, and especially the modeling of amorphous carbon and hydrocarbon thin film formation, has been of scientific interest for decades. The length and time scales which have to be covered for meaningful simulations are, however, still out of reach for quantum simulation techniques. Only quite recently insight has been gained into thin film formation using empirical potentials [1,2]. Available empirical potentials on the other hand have their own deficiencies: They either fail to describe carbon hybridization correctly, do not include hydrogen interaction, or if reliable are still too expensive. Here we present a straighforward extension of the carbon potential of Erhart and Albe [3] building on the original ideas of Brenner [4]. By utilizing an extended fitting database our potential manages to describe hybridization correctly while not sacrificing execution speed. This enables large scale studies of hydrocarbon thin film formation.

[1] M. Moseler et al., Science 209, 1545 (2005) [2] H. U. Jäger and K. Albe, J. Appl. Phys. 88, 1129 (2000) [3] P. Erhart and K. Albe, Phys. Rev. B 71, 035211 (2005) [4] D. W. Brenner, Phys. Rev. B 42, 9458 (1990)

DS 10: Layers with Magnetic Properties

Time: Monday 17:15–19:00 Location: H34

DS 10.1 Mon 17:15 H34

Thermal stability of Py/Cu and Co/Cu giant magnetoresistance (GMR) systems — •Vitaliy Vovk[1], Guido Schmitz[1], and Andreas Hütten[2] — [1]Institute of material physics, WWU Münster, Münster, Germany — [2]Institute of nanotechnology, Forschungszentrum Karlsruhe, Karlsruhe, Germany

The long-term thermal stability in thin film functional materials often becomes a critical restriction regarding the technical application. GMR multilayer (ML) systems (Co/Cu and Py/Cu) are studied in this aspect since their automotive application requires operation in hot environments.

Tomographic atom probe analysis of Py/Cu system [1] conducted in our group has shown the minor broadening of the layer interfaces to be the most probable reason for the GMR degradation. Comparable results are observed in Co/Cu system using wide angle atom probe tomography (WATAP), though the systems have rather different thermodynamics. Besides the atomic transport, another important transformation takes place at elevated temperatures. The broad <111>-changes to sharp <200>-texture during the recrystallization process. It is shown that this texture reorientation is due to the anisotropic energy terms competition in the multilayer system. Since the RKKY coupling length depends among other parameters on the crystallographic orientation of the system, the thermal stability of the GMR effect can be significantly improved by the control of texture reorientation.

[1] C. Ene, G. Schmitz, R. Kirchheim, A. Hütten, Acta Materialia **53**, 3383, 2005.