tion chamber, equipped with two Be windows to allow X-ray penetration, that was mounted on the six-circle goniometer of the Rossendorf beam line (ROBL BM20) at the ESRF (European Synchrotron Radiation Facility). The possibility to tune X-ray beam energy, to reduce air scattering and absorption, together with the high brilliance of the synchrotron source had made it possible to obtain a reliable GISAXS signal and to control the cluster morphology during growth even at the initial stage [1].

[1] V. Cantelli, J. von Borany, N.M. Jeutter, J. Grenzer, Adv. Eng. Mat. 11, 478 (2009).

DS 19.5 Wed 11:45 H2

Factors influencing metal impurity induced ion beam patterning of Si(001) — •Sven Macko[1], Frank Frost[2], Bashkim Ziberi[2], Daniel Förster[1], and Thomas Michely[1] — [1]II. Physikalisches Institut, Universität zu Köln, Germany — [2]Leibniz-Institut für Oberflächenmodifizierung e. V., Leipzig, Germany

On Si(001) ion beam pattern formation at angles $\vartheta < 45°$ with respect to the surface normal takes only place in the presence of metal impurities. Here we report experiments addressing the factors influencing impurity induced pattern formation using well controlled UHV experiments. Ion erosion is performed through fluences $> 5 \times 10^{21}$ ions/m^2 of 2 keV Kr^+ with a differentially pumped fine focus ion source. Co-deposition of metal impurities is performed through co-sputtering and co-evaporation of Fe. With increasing Fe concentration under otherwise identical conditions a smooth unpatterned surface, a dot pattern and finally for the highest Fe concentrations a ripple pattern is observed. Co-sputtering measurements at temperatures below and above room temperature lead to identical pattern sequences. Thus thermal diffusion is irrelevant for ion beam pattern formation on Si(001) at room temperature. Finally, the orientation of ripple patterns appears to be associated with the direction of impinging Fe atoms.

DS 19.6 Wed 12:00 H2

Dependence of wavelength of Xe ion-induced rippled structures on the fluence in the medium ion energy range — •Antje Hanisch[1], Andreas Biermanns[2], Jörg Grenzer[1], and Ullrich Pietsch[2] — [1]Institute of Ion Beam Physics and Materials Research, Bautzner Landstrasse 400, 01328 Dresden, Germany — [2]Institute of Physics, University of Siegen, Walter Flex 3, 57078 Siegen, Germany

Ion-beam eroded self-organized nanostructures on semiconductors offer new ways for the fabrication of high density memory and optoelectronic devices. It is known that wavelength and amplitude of noble gas ion-induced rippled structures tune with the ion energy and the fluence depending on the energy range, ion type and substrate. The linear theory by Makeev [1] predicts a linear dependence of the ion energy on the wavelength for low temperatures. For Ar^+ and O_2^+ it was observed by different groups [2] that the wavelength grows with increasing fluence after being constant up to an onset fluence and before saturation. In this coarsening regime power-law or exponential behavior of the wavelength with the fluence was monitored. So far, investigations for Xe ions on silicon surfaces mainly concentrated on energies below 1keV. We found a linear dependence of both the ion energy and the fluence on the wavelength and amplitude of rippled structures over a wide range of the Xe^+ ion energy between 5 and 70keV. Moreover, we estimated the ratio of wavelength to amplitude to be constant meaning a shape stability when a threshold fluence of 2x10^{17}cm^{-2} was exceeded.

[1] Makeev et al., NIM B 197, 185-227 (2002) [2] Karmakar et al., APL, 103102 (2008), Datta et al., PRB 76, 075323 (2007)

Topical Talk DS 19.7 Wed 12:15 H2

Synthesis of Nanostructured Films by Self-organization — •Hans Hofsäss — II. Physikalisches Institut, Universität Göttingen, Göttingen, Germany

Two approaches to achieve self-organized formation of nanostructured thin films will be discussed. In the first approach, nanocomoposite films are prepared by simultaneous deposition of two desired constitutents, e.g. the formation of metal-carbon nanocomposites by simultaneous metal and carbon ion deposition [1]. Depending on the phase diagram one would expect a homogeneous alloy or nanocomposite system. Instead, one often observes multilayered films with alternating metal and carbon layers. The formation of such layered films is explained by self-organization caused by surface segregation, clustering, sputtering and ion induced diffusion. A growth model taking into account these processes allows to predict the transition between self-organized multilayer formation and formation of homogeneous nanocomposites as function of ion energy and ion flux ratio. The second approach is surfactant sputtering [2], i.e. sputter erosion of a substrate, simultaneously exposed to a weak flux of surfactant atoms. Depending on the surfactant-substrate combination self-organized nanostructured ultrathin films are formed as a steady-state. This leads to the generation of novel surface patterns and surface nanostructures. Selected examples of will be discussed. [1] H. Hofsäss and K. Zhang, Appl. Phys. A: Mat. Sci. Proc. 92 (2008) 517 [2] I. Gerhards, H. Stillrich, C. Ronning, H. Hofsäss and M. Seibt, Phys. Rev. B70 (2004) 245418

DS 20: Gaede-Prize Talk (Linden, Stefan)

Time: Wednesday 14:00–14:45 Location: H36

Prize Talk DS 20.1 Wed 14:00 H36

Photonic Metamaterials: Novel Optics with Artificial Atoms — •Stefan Linden — Institut für Nanotechnologie, Karlsruher Institut für Technologie (KIT)

At optical frequencies, electromagnetic waves interact with natural materials via the electronic polarizability of the materials. By contrast, the corresponding magnetizability is negligible. As a result, we can only directly manipulate the electric component of light while we have no immediate handle on the magnetic component. Photonic metamaterials open up a way to overcome this constraint. The basic idea is to create an artificial crystal with sub-wavelength periods. Analogous to an ordinary optical material, such a photonic metamaterial can be treated as an effective medium. However, proper design of the elementary building blocks ("artificial atoms") of the photonic metamaterial allows for a non-vanishing magnetic response at optical frequencies - despite the fact that photonic metamaterial consist of non-magnetic constituents. This artificial magnetism can even lead to a negative index of refraction. In this presentation, I will review our results and present new developments in this interesting field.

DS 21: Invited Babonneau

Time: Wednesday 15:00–15:45 Location: H2

Invited Talk DS 21.1 Wed 15:00 H2

Self-organization of noble-metal nanoparticles on rippled dielectric surfaces produced by low-energy ion erosion — •David Babonneau, Sophie Camelio, and Lionel Simonot — Institut PPRIMME, Poitiers, France

A new route to control the morphology and the spatial organization of metallic nanoparticles, and therefore their physical properties, is to use nanostructured surfaces as templates. We will report on the development of an original approach that integrates the production of nanoripple patterns with long-range order by Xe^+ ion-etching of amorphous dielectric films (Al_2O_3, BN, Si_3N_4) and the elaboration of organized arrays of aligned Au and Ag nanoparticles by grazing incidence ion-beam sputtering. By combining direct imaging methods (TEM, AFM) and grazing incidence small-angle X-ray scattering (GISAXS) experiments associated with quantitative analysis, we will show that valuable information can be obtained on the morphology as well as lateral and vertical correlations of the nanostructures present in the nanocom-