

CPP 80: Organic Thin Films, Organic-Inorganic Interfaces: Session II (joint session DS/CPP)

Time: Friday 9:30–11:00

Location: H 0111

CPP 80.1 Fri 9:30 H 0111

Infrared studies of device relevant organic/inorganic interfaces: energetic and morphological insights — ●SABINA HILLEBRANDT^{1,2}, SEBASTIAN BECK^{1,2}, and ANNEMARIE PUCCI^{1,2} — ¹Kirchhoff-Institut für Physik, Universität Heidelberg, Germany — ²InnovationLab, Heidelberg, Germany

Organic electronic devices consist of stacked layers as well as inorganic materials. The device performance is mainly influenced by the interfaces of these layers. The investigation of charge generation, injection, and transport at these interfaces is a major key to the basic understanding of the fundamental mechanisms in organic electronics. We use self-assembled monolayers (SAM) in this context to engineer the surface of certain electrode materials, e.g. indium tin oxide (ITO) and metal surfaces, in order to improve charge injection at the organic/inorganic interface. With their inherent dipole SAMs are ought to improve the energetic alignment at the interface as well as to change the surface energy and thus the contact angle. Infrared (IR) spectroscopic studies supported by density functional theory (DFT) calculations reveal in addition to the molecular orientation of such SAMs the influence on that orientation on the subsequent organic semiconductor material. Furthermore, energy transfer between the electrode material and its modification and the organic semiconductor can be investigated, giving a deep insight into the energetic and morphological interplay at the interface.

CPP 80.2 Fri 9:45 H 0111

Probing the orientation of phosphorescent Iridium complexes by impedance spectroscopy — ●MARKUS SCHMID, THOMAS LAMPE, ALEXANDER HOFMANN, and WOLFGANG BRÜTTING — Institute of Physics, University of Augsburg, 86135 Augsburg, Germany

Impedance spectroscopy (IS) is a powerful, non-destructive method to analyze organic semiconductors and their interfaces. In organic bilayer devices, that contain one polar material, IS can be used to measure the interfacial charge density between the two semiconductors. This polarization results from partially aligned permanent dipole moments. If the permanent molecular dipole moment is known, conclusions about the molecular orientation are possible [1].

In this study we present results from IS for different polar Iridium complexes that are commonly used as emitters in organic light emitting diodes. By calculating their permanent dipole moment and their transition dipole moment via density functional theory we relate the average orientation of both vectors in the film. Additionally, the measured alignment of the molecules is compared to molecular dynamic simulations. We find good agreement between both, the often studied orientation of the transition dipole moment and the simulations.

[1] JÄGER, LARS, *et. al.* AIP Advances **6**, 095220 (2016)

CPP 80.3 Fri 10:00 H 0111

Comparative in-situ studies of Au sputter growth on homo and di-block co-polymer — ●PALLAVI PANDIT¹, MATTHIAS SCHWARTZKOPF¹, ANDRE ROTHKIRCH¹, BJOERN FRICKE¹, MARC GENSCH¹, ALEXANDER HINZ², OLEKSANDR POLONSKYI², THOMAS STRUNSKUS², SIMON SCHAPER³, FRANZISKA C. LÖHRER³, VOLKER KÖRSTGENS³, FRANZ FAUPEL², PETER MÜLLER-BUSCHBAUM³, and STEPHAN V. ROTH^{1,4} — ¹DESY, Notkestr. 85, D-22607 Hamburg — ²CAU zu Kiel, LS Materialverbunde, 24143 Kiel — ³Physik-Department, LS Funktionelle Materialien, 85748 Garching — ⁴KTH, Teknikringen 56-58, SE-100 44 Stockholm

Nanostructured gold (Au) attracts great technological interest and it is a promising candidate for functional, optical and electronic applications. A tailored metal nanoparticle-polymer interface improves the functionality of the system; attributed to the polymer-metal interactions, which are dominated by their interfacial interactions. Sputter deposition technique has been used for depositing metallic layer of few nanometer thicknesses in a controlled fashion on polymer surfaces [1]. To this end, we have investigated the morphological changes occurring at the metal-polymer interface during deposition using GISAXS and GIWAXS [2]. Optical properties of the system have also been studied in-situ and are correlated with the morphological properties of the gold nanocluster on polystyrene, polymethylmethacrylate and the corresponding di-block co-polymer. [1] Schwartzkopf et al., ACS Appl.

Mater. Interfaces **9**, 5629 (2017). [2] Schwartzkopf et al., ACS Appl. Mater. Interfaces **7**, 13547 (2015).

CPP 80.4 Fri 10:15 H 0111

Graphene based biosensing surfaces studied by IR-nanopolarimetry — ●KARSTEN HINRICHS¹, TIMUR SHAYKHUTDINOV¹, CHRISTOPH KRATZ¹, FELIX RÖSICKE², CRISTOPH ARENZ³, NORBERT H. NICKEL², and JÖRG RAPPICH² — ¹Leibniz-Institut für Analytische Wissenschaften - ISAS - e.V., Schwarzschildstr 8, 12489 Berlin, Germany — ²Helmholtz-Zentrum Berlin für Materialien und Energie GmbH, Institut für Silizium Photovoltaik, Kekuléstr. 5, 12489, Berlin, Germany — ³Institut für Chemie der Humboldt-Universität zu Berlin, Brook-Taylor-Str. 2, 12489 Berlin, Germany

AFM-IR based nanopolarimetry [1] for analysis of large area graphene pre-functionalized by diazonium compounds [2] and recognition of cysteine-modified peptide nucleic acid (PNA) [3] is presented. Homogeneity of the biosensing surfaces and the secondary structure of the PNA was studied by AFM-IR measurements. AFM-IR in a sensitive modus with synchronization between the pulse rate of the quantum cascade laser used as IR light source and the resonance of the cantilever can provide IR spectra in several seconds only. This facilitates direct insight into chemical composition, intermolecular interactions, and molecular orientation in nanoscale sub-ensembles.

[1] T. Shaykhutdinov et al, Supramolecular Orientation in Anisotropic Assemblies by IR Nanopolarimetry. ACS Macro Letters **2017**, 598-602. [2] F. Rösicke et al, Chem. Commun. **53** (2017) 9308-9311. [3] K. Hinrichs et al, Encyclopedia of Interfacial Chemistry: Surface Science and Electrochemistry 2018.

CPP 80.5 Fri 10:30 H 0111

Study of reactive ion beam planarization process of a negative tone resist for smoothing aluminium mirrors — ●MELANIE ULITSCHKA, JENS BAUER, FRANK FROST, and THOMAS ARNOLD — Leibniz-Institut für Oberflächenmodifizierung, Permoserstraße 15, 04318 Leipzig

Mirror optics are a key component for a wide range of optical systems in lithography, imaging, as well as aerospace industry. For such a specific field of applications lightweight, good machinable aluminum alloys are suitable since the reflection coefficient ranges from the UV to the IR spectral region with values well above 90%. The surface error topography after commonly manufacturing by single-point diamond turning meets the requirements for applications in the infrared spectral range. To use the aluminum mirrors in the shortwave visible and UV-spectral range one technological solution is the coating of the Al optics with a nickel-phosphorous layer and a metallization layer on top to realize ultra-smooth highly reflective surfaces. Further reduction of the surface roughness of aluminum optics and a simplification of this process chain is preferable. Ion beam planarization processes are a promising technology to transfer the ultra-smooth surface of a planarization layer into the underlying aluminum substrate. An equal etch rate for planarization layer and aluminum is the prerequisite for the transfer process. The contribution comprises investigations on the influence of different ion beam parameters on the chemical modification of the layer during the etch process, the effect of thermal pre-treatment of the planarization layer and the etch rate selectivity of layer and substrate.

CPP 80.6 Fri 10:45 H 0111

Structure-Dependent Emission of 1-(Pyridin-2-yl)-3-(quinolin-2-yl)imidazo[1,5-a]quinoline — ●GEORG ALBRECHT^{1,3}, JASMIN MARTHA HERR^{2,3}, HISAO YANAGI³, RICHARD GÖTTLICH², and DERCK SCHLETTWEIN¹ — ¹Institute of Applied Physics, JLU Giessen, Germany — ²Institute of Organic Chemistry, JLU Giessen, Germany — ³Nara Institute of Science and Technology, Japan

1,3-disubstituted imidazo[1,5-a]pyridines are receiving increased interest for applications in material science, mainly regarding organic light emitting diodes (OLED). In this work we studied the related 1-(pyridin-2-yl)-3-(quinolin-2-yl)imidazo[1,5-a]quinoline (PCIC) as a new and oxidation-stable blue emitter. Thin films were prepared by physical vapor deposition onto quartz glass, single crystals were grown from solutions or by entrainer sublimation. Thin films and crystals were characterized by AFM, XRD, optical absorbance and mainly by

steady-state and time-resolved emission and compared to results obtained in solution. Storage of the originally amorphous thin film samples revealed an interesting crystallization behaviour, which could be resolved by fluorescence microscopy and comparison to the results ob-

tained at single-crystals. A clear trend of red-shifted emission was observed for different crystalline phases relative to amorphous samples, corresponding to the change in molecular arrangement.