CPP 62: Electrical, Dielectrical and Optical Properties of Thin Films

Time: Thursday 17:45–18:30 Location: H8

CPP 62.1 Thu 17:45 H8

Functional polymer thin films with tailored properties enabled by initiated chemical vapor deposition — Stefan Schröder, Frowin Ellermann, Maximilian Burk, Stefan Rehders, Cenk Aktas, Thomas Strunskus, and •Franz Faupel — Lehrstuhl für Materialverbunde, Technische Fakultät der Christian-Albrechts-Universität zu Kiel, Kaiserstr. 2, 24143 Kiel

Initiated chemical vapor deposition (iCVD) is a solvent-free, cost efficient technique to synthesize highly conformal organic thin films from the vapor phase. The polymer film properties can be precisely tuned by the deposition parameters, which enables the synthesis of tailored thin films in the ultrathin nanometer-range, as well as micrometer-range. This enables a wide field of applications for iCVD thin films like surface functionalisation, functional dielectrics and devices. We demonstrate conformal teflon coatings of complex 3d geometries, preparation of superior electret layers for application as sensors or for energy harvesting. Further we demonstrate adhesion promotion and incorporation of azo functionalities by use of different monomers within one iCVD process.

CPP 62.2 Thu 18:00 H8

Wrinkle Motifs: Gateways toward Flexible Optical Devices — •Anik Kumar Ghosh[1], Bernhard Alexander Glatz[1], Swagato Sarkar[1], Sven Wiessner[1], Amit Das[1], Tobias A. F. König[1,2], and Andreas Fery[1,2] — [1]Leibniz-Institut für Polymerforschung Dresden e. V., Germany — [2]Cluster of Excellence Center for Advancing Electronics Dresden (cfaed), Technische Universität Dresden, Germany

Wrinkled patterns are the result of mechanical instability induced by a mechanical mismatch between two layers that is easy to handle, reproducible and very robust. A well-known way to gain such structures represents the oxidation of a pre-strained polydimethylsiloxane (PDMS) slab by plasma treatment [Microchimica Acta, 2009, 165, 249 and Soft Matter, 2015, 11, 3332]. It creates in situ a glassy layer on top, while the consequent strain relaxation of the two-layer system results in a mechanical buckling instability that forms permanent wrinkles. In our setup, we move onward by fabricating blazed grating structures via angle-dependent thin metal film deposition on top of the PDMS wrinkles enabling them for enhanced light-matter interactions. Furthermore, the aforementioned wrinkling technique provides an alternative route towards large area fabrication of grating-waveguide resonant structures. These by the virtue of flexibility can find application in opto-mechanics as well as deformed based resonance sensors following guided mode resonance (GMR).

CPP 62.3 Thu 18:15 H8

Exciton binding energy of organic materials: ground-state vs. excited-state charge-transfer complexes — •Andreas Opitz[1], Paul Beyer[1], Norbert Koch[1,2], and Wolfgang Brütting[3] — [1]Humboldt-Universität zu Berlin — [2]Helmholtz-Zentrum Berlin für Materialien und Energie GmbH — [3]Universität zu Berlin Augsburg

Organic semiconductors are materials with a high exciton binding energy (EBE), which significantly affects their electronic and optical properties. The EBE is the difference between the electronic gap (obtained by direct and inverse photoelectron spectroscopy) and the lowest optical transition energy (determined from absorption spectroscopy). In this contribution, the EBE is investigated for thin films of pristine organic semiconductor as well as charge-transfer complexes.

The EBE of pristine diindenoperylene (DIP) is about 0.50 eV. DIP combined with fullerene as acceptor was studied for photovoltaic cells and the very weak absorbtion exhibits an EBE of approx. 0.07 eV. A comparably low value was determined for the weakly interacting ground-state CTC of DIP with a dicyanoperylene-bis(dicarboxyimide) derivative (PDIR-CN2). The acceptor hexafluorotetracyano-naphthoquinodimethane (F6TCNNQ) forms a strongly interacting ground-state CTC with DIP and reveals an EBE of 0.79 eV.

The CTCs have to be distinguished by ground-state (GS) and excited-state (ES) interaction, which we will relate to the determined EBEs. The properties of the CTC excitons range here from CT to Frenkel like and are strongly dependent on interaction scheme between donor and acceptor.