DS 22: Optical Analysis of Thin Films (Reflection, Ellipsometry, Raman, IR-DUV Spectroscopy, ...): Session II

Time: Wednesday 15:00–15:45 Location: H 0111

DS 22.1 Wed 15:00 H 0111

Giant Circular Dichroism of Enantiopure Prolinol-Derived Squaraine J-Aggregate Thin Films probed by Mueller Matrix Spectroscopy — •Manuela Schiek[1], Matthias Schulz[2], Jennifer Zablocki[2], Oliya S. Abdullaeva[1], Arne Lützen[2], Frank Balzer[3], and Oriol Arteaga[4] — [1]University of Oldenburg, D. — [2]University of Bonn, D — [3]University of Southern Denmark, Sonderborg, DK — [4]University of Barcelona, ES

We have achieved sizable ex-chiral-pool synthesis of enantiopure prolinol functionalized squaraine small molecular compounds with opposite handedness. The aggregation into intrinsically circular dichroic, molecular J-aggregates with quasimetallic reflection is controlled by thermal annealing. By Mueller matrix spectroscopy [1] we show an extraordinary high but true circular dichroism in spincasted thin films spectrally located at 780 nm. The ellipticity well reaches a value of 500 mdeg/nm and an intensive dissymmetry factor of 0.75, respectively, and is evenly distributed over the complete thin film area. So far, these values have no documented rival among intrinsic supramolecular circular dichroism, and thereby are revolutionary for the development of organic based chiral photonics and spintronics. [1] O. Arteaga, B. Kahr, Opt. Lett. 38 (2013) 1134.

DS 22.2 Wed 15:15 H 0111

Temperature dependent dielectric function of CuI — •Evgeny Krüger, Vitaly Zviagin, Chang Yang, Rüdiger Schmidt-Grund, and Marius Grundmann — Universität Leipzig, Felix-Bloch-Institut für Festkörperphysik, Linnéstr. 5, Leipzig

We present optical and structural properties of CuI thin films deposited by sputtering at temperatures varying from 55°C to 310°C on c-sapphire substrate. Scanning electron microscopy scans reveal a smooth surface morphology for films grown at temperatures above 160°C and large thickness inhomogeneity for films grown at lower temperatures. X-ray diffraction reveals good crystal quality for growth temperatures above 200 °C. The dielectric function (DF) was determined in a wide spectral range between (0.5 – 8.5) eV and for temperatures from 10 K to 300 K. The main features in the DF were assigned to exciton-related optical transitions at various critical points in the Brilluoin zone, revealing non-monotonic temperature dependence of the energy as well as strong screening for excitons related to higher critical points.

DS 22.3 Wed 15:30 H 0111

Interface states revealed by DFT calculation of reflectance anisotropy spectroscopy: GaP on Si(001) — •Charles Patterson and Pankaj Kumar — School of Physics, Trinity College Dublin, Dublin 2, Ireland

States localized at crystalline interfaces between dielectrics can be probed using optical reflectance anisotropy when the light is incident from the side of the material with the larger band gap. We present first-principles calculations of the anisotropy of the GaP/Si(001) interface [1] and compare them to the interface part of the anisotropy derived from measurements on several GaP thin films on Si(001) with different thickness [2]. The calculations show excellent agreement with experiment only for a gapped interface with a P layer in contact with Si. Interfaces are gapped only when the underlying Si is doped owing to excess electrons in the dimer layer at the GaP surface. Optical excitations from two states localized in several Si layers adjacent to the interface result in the observed anisotropy of the interface. A combination of theory and optical anisotropy experiment can therefore reveal localized electronic states and the atomic structure at buried interfaces.

[1] P. Kumar and C. H. Patterson, Phys. Rev. Lett. 118 237403 (2017) [2] O. Supplie et al., Phys. Rev. B 86, 035308 (2012)