CPP 15 Special techniques

Zeit: Montag 16:30–17:45 Raum: TU C230

CPP 15.1 Mo 16:30 TU C230

Electron spin resonance imaging (ESRI) — •Michael Glied, Malte Drescher, and Elmar Dormann — Physikalisches Institut, Universität Karlsruhe (TH), D-76128 Karlsruhe, Germany

Electron spin resonance imaging is a technique using the same principles as the established nuclear magnetic resonance imaging, while the very fast electron spin relaxation time constants are an experimental challenge. In order to perform dynamical imaging, we use also pulsed X-Band ESR and the backprojection reconstruction as well as the fourier imaging method. We present here our recent results focused on 2D- and 3D-imaging of quasi one-dimensional organic conductors, where even pulsed conduction electron spin resonance is possible.

CPP 15.2 Mo 16:45 TU C230

Sub-microsecond molecular thermometry using thermal spin flips — •Joachim Stehr, John M. Lupton, Martin Reufer, Gunnar Raschke, Thomas A. Klar, and Jochen Feldmann — Photonics and Optoelectronics Group, Department of Physics and CeNS, Ludwig-Maximilians-Universität, 80799 Munich

We recently presented a highly sensitive molecular thermometer based on dual emission from the commonly used organic semiconductor platinum octaethyl porphyrin (PtOEP). This enables contact free optical thermometry of very thin films of conjugated polymers, such as in light-emitting diodes. [1]

We have now improved our detection scheme and are able to demonstrate the exceptional time resolution achievable with PtOEP molecular thermometers by measuring the instantaneous temperature of a conducting metallic strip line on the nanosecond time scale. As the molecular thermometer works by thermally activated emission from a long-lived meta-stable state, we are able to achieve fluorescence based thermal imaging without the potentially perturbing influence of the exciting light source. With its giant thermochromism PtOEP can also be used for direct non-contact thermal imaging. [2]

[1] J. M. Lupton, Appl. Phys. Lett. 81, 2478 (2002)
[2] J. Stehr et. al. Adv. Mater., in press

CPP 15.3 Mo 17:00 TU C230

Noncontact atomic force microscopy under ambient conditions using tuning fork sensors — •S. Strömsdörfer, V. Dremov, and P. Müller — Physikalisches Institut III, Universität Erlangen-Nürnberg

We describe the operation of an atomic force microscope based on a 32 kHz quartz tuning fork sensor under ambient conditions. As additional masses change the quality factor Q of the sensor, it is desirable to have tips as small as possible. We present a reliable technique of lightweight tip preparation. We grow both hydrophobic amorphous carbon tips and ultra-sharp metallic tips as well as single-wall carbon nanotube bundles. In all cases, besides frequency shifts of approximately 10 Hz, the decrease of Q is only a few percent.

In non-contact AFM mode, a rather wide range of samples is accessible for investigations. In particular, objects with weak adhesion to the substrate and soft materials have been investigated. We demonstrate the ability of our technique to observe the existence of liquid adsorbates.

CPP 15.4 Mo 17:15 TU C230

Force spectroscopy mapping of soft nano-objects — •V. Dremov[1], D. Klinov[2], S. Strömsdörfer[1], and P. Müller[1] — [1]Physikalisches Institut III, Universität Erlangen — [2]Shemyakin-Ovchinnikov Institute of Bioorganic Chemistry, RAS, Moscow, Russia.

We have developed a method of growing diamond-like carbon nonconductive whiskers at the end of standard silicon cantilevers. In addition we were able to produce ultrasharp W, Co, and Ru tips using field emission procedures. The radius of curvature of these probes is less than 1nm. Force spectroscopy mapping was performed using point by point recording the force distance curves. Very high resolution was achieved during investigations of supramolecules as well as DNA molecules adsorbed on mica. We conclude with high resolution measurements of DNA in liquid environments.

CPP 15.5 Mo 17:30 TU C230

Astonishingly long ranged mechanical interphases at polymer/solid boundaries — •U. Müller[1,2], D. Liebschner[1,2], M. Sander[1,2], R. Bactavatchalou[1,2], R. Sanctuary[1,3], W. Possart[1] und J.K. Krüger[1,2] — [1]Laboratoire Européen de Recherche Universitaire : Saarland-Lorraine — [2]Experimentalphysik, Universität des Saarlandes, Bau 38, D-66041 Saarbrücken — [3]Laboratoire de Physique des Matériaux, Campus Luxembourg-Limpertsberg, L-1511 Luxembourg

Boundaries between a reactive polymer system, in our case an epoxy, and solid substrates modify the mechanical properties of the polymer in the interface-near region. The so created interphases are of unexpected width up to several hundred micrometers. For the understanding of the overall mechanical properties of such polymer compounds it is of special importance to know the spatial variations of the elastic properties inside the bond material. The spatial mapping of the mechanical properties was performed by high resolution Brillouin microscopy. Our investigations show that width and shape of theses interphases depend strongly on the kind of polymer system, the substrate material and preparation conditions. Possible origins of the creation of elastic interphases are mechanical stresses due to polymerisation shrinkage or diffusive transport of chemical specimens.