

responsive hydrogel.[2] A free-radical polymerization is initiated via an electron transfer from the electrode to an electrochemically active initiator. The progress of polymerization was monitored by means of the electrochemical quartz crystal microbalance (EQCM). Typical thicknesses are in the range of up to 100 nm. The water content varies between 20 and 80 %. AFM micrographs reveal a globular structure. The permeation of ions through the gel is possible, as proven by CV runs in the presence of  $K_3[Fe(CN)_6]$  in the bulk. First experiments have been performed to explore biomedical applications such as cell-sheet engineering [3] or stimulated drug release [4]. In cell culture, the layers show low-fouling properties. A second application are polymer metal composites: galvanic deposition of copper particles onto the polymer-covered surface has been demonstrated. References: [1] N. Baute, C. Jérôme, et al., *European Journal of Inorganic Chemistry* 2001, 1097. [2] H.G. Schild, *Progress in Polymer Science* 1992, 17, 163. [3] A. Kikuchi, T. Okano, *Journal of Controlled Release* 2005, 101, 69. [4] A. Kikuchi, T. Okano, *Advanced Drug Delivery Reviews* 2002, 54, 53.

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**Substrate-Consuming Metal-Organic Layers (SCMOLs) from Thiol Derivatives - a combined SAXS/SEM Study.** — ●BIRGIT RIEDEL<sup>1</sup>, MATTHIAS BARCZEWSKI<sup>1,2</sup>, JOCHEN GEERK<sup>3</sup>, THOMAS SCHIMMEL<sup>1,2</sup>, and STEFAN WALHEIM<sup>1</sup> — <sup>1</sup>Institute for Nanotechnology, Forschungszentrum Karlsruhe, 76021 Karlsruhe (Germany) — <sup>2</sup>Institute of Applied Physics, University of Karlsruhe, 76131 Karlsruhe (Germany) — <sup>3</sup>Institute for Solid-State Physics, Forschungszentrum Karlsruhe, 76021 Karlsruhe (Germany)

Substrate-Consuming Metal-Organic Layers (SCMOLs) were prepared using a variety of thiol molecules. This new type of metal-organic dielectric films grow at room temperature from solution at the interface of the metal substrate and the newly formed metal-organic film. The resulting morphological characteristics of the various compounds were investigated by Small Angle X-Ray Scattering (SAXS) and Scanning Electron Microscopy (SEM). A strong correlation of the structural data and the molecular architecture could be observed and will be discussed. First results on the optical properties of these solid transparent films - with a thickness pre-selectable from a few nanometer up to 1 micrometer - will be presented.

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**Synthesis, structure and *ab initio* calculations of three-dimensional polymers of  $C_{60}$  fullerene.** — ●NAGESH KINI, AKIRA KUBO, and SHOJI YAMANAKA — Department of Applied Chemistry, Graduate School of Engineering, Hiroshima University, Higashi Hiroshima - 739-8527, Japan.

Solid  $C_{60}$  fullerene is known to polymerise in one, two or three dimensions under high pressure and high temperature (HPHT) conditions. Earlier, we have reported structures of orthorhombic and rhombohedral two-dimensional (2D) polymers determined by x-ray diffraction of single crystals synthesised under HPHT conditions. Recently we have obtained good quality single crystals of three-dimensional (3D) polymers of  $C_{60}$  fullerenes by a topochemical conversion under HPHT conditions. The three different types of single crystals of 3D polymers obtained are: an orthorhombic 3D polymer (polymerised from orthorhombic 2D polymer), a rhombohedral 3D polymer (polymerised from rhombohedral 2D polymer) and a 3D cubic (fcc) polymer (polymerised from monomer (fcc)  $C_{60}$ ). The structures of these 3D polymers were determined by single crystal x-ray diffractometry using a Rigaku R-axis diffractometer attached with an imaging plate (IP). The structures were geometrically optimised by *ab initio* calculations and the relative stabilities of the 3D polymer structures were compared.

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**Chemisorption of PTCDA on Ag(110): A quantum chemical study** — ●AFSHIN ABBASI, MICHAEL SCHREIBER, and REINHARD SCHOLZ — Institut für Physik, Technische Universität Chemnitz

Experimental studies of PTCDA monolayers on Ag(110) have revealed an adsorption geometry where each molecule is placed on top of 12 substrate atoms [1]. In the present work, we investigate a non-periodic approximant of this interface, including one PTCDA molecule and one or two layers of silver. Both in Hartree-Fock and DFT calculations, the anhydride oxygen atoms experience a strong interaction with the substrate, resulting in a bended geometry with an Ag-O bond length of about 2.4 Å. Several orbitals delocalized over the molecule and the topmost substrate layer result in a large positive net charge of the adsorbate. As most of the

negative charge in the topmost layer of the substrate resides below the positively charged perylene core, the Coulomb interaction between substrate and adsorbate contributes a substantial part to the total binding energy.

The calculated adsorption geometry is analysed in terms of the chemical hardness of the electronic orbitals, electronic excitations, and the infrared activity of the molecule along the substrate normal.

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**Fabrication and electrical characterization of Polypyrrole nanowires** — ●JÖRN-HOLGER FRANKE, BIN DONG, LIFENG CHI, and HARALD FUCHS — Physikalisches Institut and CENTech, Wilhelm-Klemm Str. 10, WWU Münster

E-Beam Lithography is used to pattern a resist structure (PMMA-Resist on Silicon-Wafer) which is subsequently used as a mask for copolymerization of Pyrrole and N-(3-Trimethoxysilyl-Propyl) Pyrrole. The Trimethoxysilyl group of the latter one binds covalently to the Silicon Dioxide of the Wafer, thereby enabling the generated Polypyrrole nanowires to survive the following Lift-Off Process. Gold electrodes are evaporated on top of the resulting Polypyrrole to form easily accessible electrodes for conductivity measurements. The dependence of specific conductivity on nanowire diameter is studied.

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**Electrode Stability in Electrochromic Systems Based On Flexible Substrates** — ●ROLAND WAGNER<sup>1,2</sup>, ROLAND WEISS<sup>1</sup>, GOTTHARD RIEGER<sup>1</sup>, and JÜRGEN R. NIKLAS<sup>2</sup> — <sup>1</sup>Siemens AG Corporate Technology, Dept. CT MM 1, Erlangen, Germany — <sup>2</sup>Technical University Bergakademie Freiberg, Freiberg, Germany

Electrochromic (EC) systems use materials that change their color when an electrical voltage is applied. Due to redox processes the intra molecular electron configuration is affected causing different absorption spectra. Electrodes of this EC system are exposed to an aggressive environment, as electrons are exchanged at the interface of solvent based electrolytic EC material and flexible electrodes. Especially the transparent top electrode, which is typically ITO on thin PET films, degrades during device operation. Metals (e.g. Cu), TCO and polymer (e.g. PEDOT) based materials are tested as back and top electrode for its degradation under different conditions, e.g. accelerated lifetime tests and voltage cycling. Optical and electrical properties like contrast and current behavior are discussed as well as degradation processes and mechanisms.

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**Cyclo-olefin-polymer ferroelectrets: Electric charging, piezoelectric activity and thermal stability** — ●OLENA VORONINA, MICHAEL WEGENER, WERNER WIRGES, and REIMUND GERHARD-MULTHAUPT — University of Potsdam, Department of Physics, Am Neuen Palais 10, D-14469 Potsdam, Germany

Non-cellular cyclo-olefins are known for their good charge-trapping properties. Their charge stability is quite comparable to that of the best known polymer electrets FEP and PTFE [1]. Thus, cyclo-olefins are interesting candidates for the development of piezoelectric polymer foams, so-called ferroelectrets. Ferroelectrets are cellular polymer films containing air-filled voids. Their piezoelectricity is based on an optimized combination of bipolar internal charging of the voids (which thus become giant electric dipoles) and of a rather low elastic modulus. An applied mechanical stress changes the void size and leads to an electrical signal.

Recently, cyclo-olefin polymers were developed into ferroelectret polymer films [2]. We briefly describe the preparation process and discuss the electric charging, the piezoelectric properties and the thermal stability of the new ferroelectrets. The results demonstrate that the piezoelectric activity is thermally stable at least up to 110°C, which is a significant improvement of the service temperature in comparison to other ferroelectret polymers.

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