ADVANCED MATERIALS SCIENCE

Fields of Expertise TU Graz

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Anna Maria Coclite,
Christof Sommitsch,
Gregor Trimmel
Advanced Materials Science
Source: Lunghammer – TU Graz

We are happy to announce that the Field of Expertise Advanced Material Science has a new management team: Anna Maria Coclite from the Institute of Solid State Physics, Christof Sommitsch from the Institute of Material Science, Joining and Forming and Gregor Trimmel from the Institute for Chemistry and Technology of Materials.

Anna Maria Coclite works on surface modification by thin film deposition. A thin film is a layer of material ranging from fractions of a nanometer to several micrometers in thickness. The future generation of devices, e.g. wearable electronics, requires miniaturization and control of the material properties to the nanoscale. For this reason, advanced methods for the growth of thin films are being studied in Anna's lab. She also received an ERC Starting grant of approx. 1.5 million euros to combine different thin films and form a sensor matrix for applications as artificial skins.
Christof Sommitsch is focusing on the development of new structural materials such as ultra-high strength steels and high-temperature materials. Different additive manufacturing processes i.e. wire and powderbed-based printing are investigated. For the latter, selective laser melting of Ti alloys, tool steels and magnetic materials are studied. In addition, material design and manufacturing is supported by physically based modelling and simulation. Materials behaviour during thermo-mechanical processing (forming, joining) and in service (creep, corrosion) is tested and analysed by means of advanced lab equipment.
Gregor Trimmel looks at new materials for photovoltaics with a special focus on the preparation of new organic semiconductors, lead-free perovskites as well as inorganic-organic hybrid systems for alternative, printable and flexible solar cells. In addition, he works on the synthesis of functional polymers and the development of elastomeric materials.

Bernhard Gadermaier:

Extending the Building Blocks of Materials Science: What Viruses have to Offer.

When it comes to nanotechnology, nature is truly the most successful researcher. Whereas we are still struggling with large-scale production of three-dimensional, nano-sized materials, nature perfected this task in viruses long before the dawn of humanity. Bionanotechnologists use these viral structures as templates for the synthesis of nanostructured inorganic materials with new outstanding properties.

One of the major challenges of the 21st century is the need for sustainable energy conversion and energy storage devices. Therefore, we have to identify novel materials for energy storage and at the same time, we have to develop low-energy consuming and sustainable strategies to prepare such materials on a large scale. The use of biological templates represents an elegant way to alter the morphology and properties of materials synthesized by e.g. aqueous precipitation routes. Using this approach, we prepared highly anisotropic cathode materials for Li-ion batteries with surface-dominated properties and particle shapes resembling the template. Such cathode materials are often amorphous, a state not easily attainable by other synthesis routes. The material properties of the amorphous state are very different from those of their crystalline counterparts and are, if the particles are nano-sized, highly dependent on the shape, i.e. morphology, and concomitantly, on the surface-effects. Thus, the material properties can be changed and ultimately fine-tuned using this fairly novel and unconventional method. >