



Position Profile for Chinese Applicants running for 2019 Helmholtz – OCPC – Program

PART A (Info about the Position)

Helmholtz Centre and institute: DESY

Title of the project: Layer-by-layer coating of sustainable functional composites based on cellulose and noble metal nanoparticles

Project leader: Prof. Dr. Stephan V. Roth

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Description of the project (max. half page):

Cellulose nanofibrils (CNF) offer tremendous advantages as sustainable materials for advanced templates in organic electronics and sensors: in CNF templates, their morphology can be tailored with ultra-low roughness, the individual CNF show ultimate strength, and the template's porosity – needed for functionalisation by filling – can be tuned. The functional composites are composed of multilayers of different materials. Often, noble metal nanoparticles are incorporated to act as highly sensitive plasmon-based sensors, or to yield CNF-based soft flexible electronics. We aim to investigate the layer-by-layer (LbL) coating of CNF and functionalized gold nanoparticle (AuNP) multilayer structures for sensor and flexible electronics applications. We first plan to use the spray coating devices of the DESY applicant and the combination with in situ GISAXS/GIWAXS experiments at P03 allows to observe the nanostructuring time- and depth-resolved during spray coating of the multilayers. Secondly, we investigate the influence of solvents on CNF gelation and nanoparticle sedimentation and study the surface properties of the layers by using the P03 contact angle device. This can in addition be seen as a prerequisite for the third step, namely the ink-jet printing, provided by the collaborating Chinese institution Sun Yat-sen university (contact: Prof. Dr. Peng Zhang). Acid stabilized dispersion of AuNP with conductive ligands will be inkjet-printed on the wet CNF layer to form designed electrical circuits. The structure-property correlations of these hybrids will be studied by scanning electron microscope and resistivity measurements as well as their functionality as biosensors. All coating steps will be investigated in situ using surface and interface sensitive scattering techniques available at the DESY photon science.

Required qualification of the post-doc:

- PhD in physics, chemistry, or material science
- Experience with surface coating, chemical synthesis, polymer chemistry
- Additional skills in X-ray diffraction or scattering

**PART****B (Materials and Procedures)**

The applicants shall submit the following documents to a Chinese postdoc station affiliated to a research institution or a university, after passing through the internal selection, the qualified application shall be forwarded to OCPC, and then to Helmholtz for evaluation:

- Detailed description of the interest in joining the project (motivation letter)
- Curriculum vitae, copies of degrees
- List of publications
- 2 letters of recommendation
- Proof of command of English language

PART C (General Conditions)**Additional requirements on the postdoctoral fellows:**

- Chinese citizenship from Mainland China (allows application while staying abroad)
- Max. age of 35 years, PhD degree not more than 5 years by submission of application
- Very good command of English language
- Strong ability to work independently and in a team