Expertise of Humboldt-Universität zu Berlin

Integrative Research Institute for the Sciences IRIS Adlershof

The Integrative Research Institute for the Sciences IRIS Adlershof is one of Humboldt-Universität‘s most successful projects, that was developed within the framework of the university’s institutional strategy (“Zukunftskonzept”). IRIS Adlershof’s interdisciplinarity brings together the core competences of modern optics, molecular systems, mathematical physics, and computation in the sciences. IRIS Adlershof combines elements of a research institute, a development laboratory, and an institute for advanced studies and sustainably links the Humboldt-Universität with pertinent non-university institutes and innovative enterprises.

The research on "Hybrid Systems for Optics and Electronics" is currently one of the main research areas of IRIS Adlershof. Hybrid inorganic/organic systems structured on atomic, molecular and mesoscopic length scales offer completely new possibilities for the implementation of optical and electronic properties and functions approaching fundamental limits. Based on physico-chemical concepts and inspired by the extraordinary efficient way functions are implemented in natural systems, the structure-property relationships of these novel hybrid materials will be investigated and explored for their application potential. This highly innovative area of research offers great opportunities for the development of completely new types of functional elements for electronics, optoelectronics and photonics. But for a successful work in this research area, the still largely separated worlds of chemistry and physics need to be integrated in the form of a joint research project, which put very specific demands on both the participating scientists as well as the infrastructure they would use.

Most important for the future development of this research area is the successful securing of funds for a new research building for "Hybrid Systems for Electronics, Optoelectronics and Photonics" with the German Science Council (Wissenschaftsrat). With its decision the Science Council evaluated IRIS Adlershof’s research approach as highly significant for the country. The combination of organic and inorganic materials is attested uniqueness complementary to programs at other German research centres. The federal and state governments have allocated a total of 44 million euros to finance this building project. The research building will be opened in 2018 and it will provide more than 1,400 m^2 office space and 2,500 m^2 laboratory space for hybrid materials research. The centrepiece of the new building is a combined lab with a clean-room where various synthesis methods can be connected with in-situ and on-line analysis methods. The experimental work goes hand in hand with theoretical modelling.

www.iris-adlershof.de

Kontakt: **Humboldt-Universität zu Berlin**

Servicezentrum Forschung
Ziegelstraße 13c
10117 Berlin

Daniela Rings

Innovation Management
E-Mail: *daniela.rings@hu-berlin.de*
Tel: 030 2093 70763

Department of Chemistry

Humboldt-Universität's Chemistry Department focuses on two promising areas of research:

- functionally structured materials and catalysis
- chemical biology

Both areas are devoted to the investigation of structure-action principles in collective ensembles (inorganic and organic materials) and in molecular structures (homogeneous catalysis, functional polymers, biologically effective systems) respectively. Aiming to gain a better understanding of these interrelations and to develop highly efficient materials, researchers employ synthesis analysis cycles. Another goal is to analyze and to influence biological systems.

Different work groups from several disciplines contribute to the research topic "functionally structured materials and catalysis". The Chemistry Department's potential ranges from sophisticated solid-state synthesis to anaerobic syntheses in solution phases and to more specific organic as well as polymer synthesis. High routine level chemical characterization is carried out applying sophisticated spectroscopic methods.

Techniques from theoretical chemistry support the investigation of structure and functions of nanomaterials, optical materials and (polymer) solids.

www.chemie.hu-berlin.de

Department of Physics

The main research activities of the Physics Department of Humboldt-Universität zu Berlin evolve around these topics:

- (elementary) particle physics
- solid state physics
- macromolecules/complex systems
- optics/photonics

Further research areas are physics education and cross-departmentally mathematical physics.

The Physics Department's scientists contribute substantially to six collaborative research centers ("Sonderforschungsbereiche") and three graduate schools. Moreover the Department is involved in interdisciplinary research alliances like the Integrative Research Institute for the Sciences (IRIS Adlershof), the Humboldt-Zentrum für Moderne Optik (HZMO, Humboldt Center for Modern Optics) and the Center of Computational Sciences Adlershof (CCSA).

www.physik.hu-berlin.de

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Innovation Management
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