

## Invitation to iCONM Scientific Seminar

Speaker : Prof. Dr. Ulrich S. Schubert  
Laboratory of Organic and Macromolecular Chemistry (IOMC)  
Friedrich Schiller University Jena, Germany

Title : Next generation pharmapolymers and AI/ML-assisted  
nanoparticle libraries for nanomedicine applications

Date & Time : November 20, 2023, 2pm-4pm (including Discussion)

Place : iCONM #3001 Meeting Room

### Summary :

The development of functional and specifically optimized polymers for modern medicine is of increasing importance. Especially in the field of nanomedicine, polymers can play a crucial role as smart nanoparticle-forming materials. By matching the properties of polymer and nanoparticles, it is possible to target organs or regions of interest. To this end, polymeric nanoparticles are prepared that contain active ingredients that can be transported to the appropriate site. This minimizes side effects and increases the drug concentrations at the specific site of action.

However, research on such polymers has been very haphazard, and general structure-property relationships are poorly known and studied. The Jena approach pursues the synthesis of systematic polymer and nanoparticle libraries using high-throughput experiments (HTE) and their subsequent detailed analysis with respect to their properties. The large number of experiments generates many data sets that can be used for evaluation and analysis. In perspective, this makes it possible to develop a tailor-made design of new pharmapolymers and particles in order to target a specific organ or region in the human body.

This new approach will change the development of pharmaceutical polymers and the design of nanoparticles for nanomedicine in the long term, ultimately enabling general structure-property relationships. In addition, the current gold standard PEG as stealth polymer needs to be replaced due to the widespread existence of antibodies. This is particularly important for mRNA drug development.

### Selected recent references:

*Small* **2023**, doi: 10.1002/smll.202306116; *Cell Reports Phys. Sci.* **2023**, *4*, 101553; *Adv. Funct. Mater.* **2023**, doi: 10.1002/adfm.202309844; *Int. J. Pharmaceutics: X* **2023**, *5*, 100173, *Macromol. Rapid Commun.* **2023**, *44*, 2200651; *J. Chem. Edu.* **2023**, *100*, 751; *ACS Appl. Polym. Mater.* **2022**, *4*, 3417-3425; *Biomacromolecules* **2022**, *23*, 3593-3601; *Progr. Polym. Sci.* **2022**, *129*, 101547; *Polymers* **2022**, *14*, 292; *Bioconjugate Chem.* **2022**, *33*, 97-104; *J. Nanobiotechnology* **2022**, *20*, 5; *Cell. Mol. Life Sci.* **2022**, *79*, 40; *Biomacromolecules* **2021**, *22*, 4521-4534; *Adv. Sci.*

**2021**, 2102429; *Adv. Mater.* **2021**, 33, 2004940; *Eur. Polym. J.* **2021**, 156, 110606; *Macromol. Rapid Commun.* **2021**, 42, 2100132; *EMBO Mol. Med.* **2021**, 13, e14436; *Angew. Chem. Int. Ed.* **2021**, 60, 4925-4930; *ACS Nano* **2021**, 15, 12298-12313.

## Biography of Prof. Ulrich S. Schubert

Ulrich S. Schubert performed his Ph.D. studies at the Universities of Bayreuth/Germany and South Florida/USA. After a postdoctoral training position with Prof. Lehn at the University of Strasbourg/France, he moved to the TU Munich/Germany and obtained his Habilitation in 1999. In 1999–2000 he was professor at the University of Munich/Germany, and during 2000 and 2007 full professor at the TU Eindhoven/The Netherlands. Since 2007, he has been a full professor for organic and macromolecular chemistry at the Friedrich Schiller University Jena/Germany. He is the founding director of the Center for Energy and Environmental Chemistry Jena (CEEC Jena) and the Jena Center for Soft Matter (JCSM) as well as the coordinator of the EU ETN POLYSTORAGE, of the DFG priority program “Polymer-Based Batteries” (SPP 2248) and spokesman of the DFG collaborative research center SFB1278 “PolyTarget”.

Ulrich S. Schubert is co-author of 1.200 scientific publications. They received 67.500 citations (Google Scholar 90.500); his h-index is 115 (Google Scholar 132). Ulrich S. Schubert is listed as "highly cited researcher" since 2014. In addition, he is an external scientific member of the Max Planck Society (MPG/Germany), elected member of acatech (National Academy of Science and Engineering/Germany), elected fellow of the National Academy of Inventors/USA and fellow of the Royal Society of Chemistry/UK. U.S. Schubert was awarded with the Federal Cross of Merit/Germany and named University Professor of the Year 2019/Germany. Since July 2023 he is founding director of the new Helmholtz Institute HIPOLE JENA (as part of the Helmholtz Center Berlin, HZB).

### Prof. Dr. Ulrich S. Schubert

Friedrich Schiller University Jena

Laboratory for Organic and Macromolecular Chemistry

Jena Center for Soft Matter (JCSM)

Center for Energy and Environmental Chemistry Jena (CEEC Jena)

Humboldtstrasse 10, 07743 Jena, Germany

[www.schubert-group.de](http://www.schubert-group.de); [ulrich.schubert@uni-jena.de](mailto:ulrich.schubert@uni-jena.de)

