Thin Films & Interfaces Group
Laboratory for Multiscale Materials Experiments

Monday, 19 November 2018
Paul Scherrer Institut
Room: OSGA/EG06

Special Seminar: Guest Speaker Prof. Michael Grunze

Max Planck Institute for Medical Research and Max Planck School Matter to Life

14:00 – 14:45 **Non-toxic surfaces which prevent marine biofouling**

15:00 – 15:20 **Max Planck School *MATTER* to *LIFE***

Abstracts

Non-toxic surfaces which prevent marine biofouling

Biofouling, i.e. the settlement and colonization of bacteria and spores on surfaces is a major economic and environmental problem. Besides the obvious problems which biofouling causes in the clinical environment, biofouling is a serious problem also in food processing, aquacultures, shipping, underwater structures and ship hulls, heat exchangers, and buildings in tropical environments. The common—but environmentally extremely problematic—way to deal with biofouling is to incorporate heavy metals and/or biocides to kill the colonizing organisms. Hence, there is an urgent need to develop environmental benign stable and long lasting coatings to prevent biofouling.

The biofouling environment consists of multiple and often cooperatively interacting species of various sizes. Significant differences in the initial settlement behavior of bacteria, spores, cyprids and diatoms are observed on different chemical surface compositions, but the continuous deposition of dissolved macromolecules and polymers on “inert chemistries” leads to a “conditioning film” which soon renders any chemical modification of the surface useless. Topographic structures on surfaces change the macroscopic properties such as their wetting behavior, but also have a pronounced effect on how single cells and organisms attach, settle, and proliferate on the substrate. Both the enhancement of settlement, such as in cell cultures, but also the suppression of settlement can be the outcome of surface structuring. Promising are slippery liquid-infused porous surfaces (SLIPSs) which have been reported for their remarkable initial antifouling properties. However, their long-term stability against fouling is compromised by unavoidable defects in the SLIPS surface, and the slow deposition of a conditioning film.

In this presentation, I discuss if present research and development approaches are successful in creating lasting non-toxic non-fouling coatings for artificial surfaces. I will outline the different concepts to fouling prevention, and the challenges and technical difficulties encountered to realize long term stability and efficiency against fouling.

Max Planck School *MATTER* to *LIFE*

A joint Master's and Ph.D. degree program of the Max Planck Society and the Universities of Heidelberg, Göttingen and TU Munich and the Leibnitz Institute for Interactive Materials

www.maxplanckschools.org/matter-to-life

This new Max Planck school in Germany aims to attract the best graduate students world-wide to study and perform research in an ascending and rapidly growing new area of science, the reverse engineering of living systems. The school offers a 2- year Master's Degree followed by a 3-year Ph.D. program. It is a joint initiative of the Max Planck Society, represented by a number of Max Planck Institutes, several top German Research Universities, and the Leibnitz Institute for Interactive Materials in Aachen.

The curriculum and the science are centered around the basic question: What is life? We will work on a quantitative description from the perspective of physics, chemistry and biology. Scientists have learned a lot in the last thirty to forty years about how organisms work, how a cell works, and we are fascinated by nature's achievements. The basic components and building blocks of cells are now known, making it possible to combine the ingredients needed to create a rudimentary cell that is able to mimic a living cell in its functionality. The goal of the school is to educate the next generation of highly interdisciplinary bioengineers by involving them in scientific discovery and reasoning at a very early stage. The curriculum and the organization of the school are aimed at teaching critical analysis of the literature and data, out-of-the-box interdisciplinary thinking, and achieving independence as a young investigator. Each student will be supervised by two faculty mentors and advisors from different disciplines.

Admission to the school with be competitive and based on merit, but not restricted to a specific discipline. Majors in Chemistry, Biology, Engineering, Physics, and Mathematics are invited to apply for this tuition-free Max Planck School in Germany. In addition, Master's and Ph.D. students will be provided with a generous monthly stipend, free housing, health insurance, and funds to cover travel expenses between the participating institutions.

Learn more on our web page ***www.maxplanckschools.org/matter-to-life***, where you can also find a detailed interview with Joachim Spatz, the director of the school.