13. Workshop Projekthaus NanoBioMater

Sprecher: Prof. Dr. Sabine Laschat **Koordinatoren:** Prof. Dr. Christina Wege, Prof. Dr. Günter Tovar
Leitungsgremium: Prof. Dr. Joachim Bill, Prof. Dr. Franz Brümmer, Prof. Dr. Holger Jeske, Prof. Dr. Sabine Ludwigs, Prof. Dr. Ingrid Weiß
Teamleiter: Dr. Claudia Koch, Dr. Dirk Rothenstein, Dr. Alexander Southan

Datum: 18. Juli 2018
Uhrzeit: 13:30 - 15:40 Uhr
Raum: Raum 6AB am Fraunhofer IGB, Nobelstr. 12, 70569 Stuttgart – B-Gebäude 6.OG

Programm

13:30 – 13:35 Uhr **Begrüßung**
Prof. Dr. Christina Wege und Prof. Dr. Günter Tovar
Koordinatoren Projekthaus NanoBioMater

13:35 – 14:00 Uhr **Functional Polymer Films**
Prof. Dr. Sabine Ludwigs
Institut für Polymerchemie
Universität Stuttgart

14:00 – 14:25 Uhr **Cryo-Scanning electron microscopy (cryo-SEM) in biomineralization research**
Dr. Marie-Louise Lemloh
Institut für Biomaterialien und biomolekulare Systeme, Abt. Biobasierte Materialien,
Universität Stuttgart

14:25 – 14:40 Uhr Kaffeepause

14:40 – 15:00 Uhr **Surface Characteristics and Structure Property Relations of Functional Poly(ethylene glycol)-based Block Copolymers at the Water-Air Interface**
Karishma Adatia
Institut für Grenzflächenverfahrenstechnik und Plasmatechnologie
Universität Stuttgart

15:00 – 15:20 Uhr **Design of novel cross-linkers for bio-inspired hydrogels**
Nicole Schädel
Institut für Organische Chemie
Universität Stuttgart

15:20 – 15:35 Uhr **Progress in NanoBioMater**
Dr. Claudia Koch, Dr. Dirk Rothenstein, Dr. Alexander Southan
Projekthaus NanoBioMater

15:35 – 15:40 Uhr **Schlussworte**
Prof. Dr. Christina Wege und Prof. Dr. Günter Tovar
Koordinatoren Projekthaus NanoBioMater

Functional Polymer Films

Prof. Dr. Sabine Ludwigs
Institut für Polymerchemie, Universität Stuttgart

The presentation will give an overview about current activities in our team on the manipulation of thin films of conducting polymers. This includes structural control on the molecular and mesoscopic scale by controlled polymerization techniques and by directed crystallization, e.g. with solvent vapor annealing. We are particularly interested in electronic and electrochemical devices which deal with chemical or electrochemical doping of the polymer films, such as thermoelectric devices, battery or actuator applications. In terms of electronic transport both p-type and n-type polymers are in the focus of research. Recent highlights on ionic conductivity in conjugated polyelectrolyte films will be also discussed.

Cryo-Scanning electron microscopy (cryo-SEM) in biomineralization research

Dr. Marie-Louise Lemloh
Institut für Biomaterialien und biomolekulare Systeme, Abt. Biobasierte Materialien, Universität Stuttgart

Cryo-scanning electron microscopy (cryo-SEM) of rapidly frozen samples is a strong tool in characterizing the properties of organic- inorganic interfaces e.g. in biobased materials, mineralized tissues or bio-inspired composites. Advantages and disadvantages of this method as well as emerging techniques like cryo-FIB SEM and cryo-correlative light electron microscopy (CLEM) will be discussed using examples from biomineralization research.

Surface Characteristics and Structure Property Relations of Functional Poly(ethylene glycol)-based Block Copolymers at the Water-Air Interface

Karishma Adatia
Institut für Grenzflächenverfahrenstechnik und Plasmatechnologie, Universität Stuttgart

We used Langmuir film balance experiments to investigate the surface properties and the structure property relations of vinylbenzyl-terminated poly(furfuryl glycidyl ether)-*block*-poly(ethylene glycol) block copolymers PEG_9FG_{10} – $PEG_{111}FG_{13}$ at the water-air interface. We could prove that all our block copolymers align at the surface and that a change in the hydrophilicity of the end group (hydroxyl vs. 4-vinyl benzyl) effects the surface activity. Additionally the block lengths and the molecular weight influence the structure property relations of the block copolymers at the water-air interface, such as the π-A isotherm onset shifts to bigger areas per molecule with growing molecular weight. Furthermore the films of the hydrophilic block copolymers showed a higher stability at constant area compared to the hydrophobic block copolymers. In accordance with the film stability measurements, we could correlate the film degradation during hysteresis cycle with the HLB value of our block copolymers, as we observed more film decline with an increasing HLB value. Recovery experiments revealed that our block copolymers recover partly to the water-air interface after 12 h, which enabled us to propose a reversible folding mechanism for our block copolymer films at the water-air interface. Based on the results of our surface properties investigations, we think that our block copolymers are promising surface functionalization reagents for hydrogels.

Design of novel cross-linkers for bio-inspired hydrogels

Nicole Schädel
Institut für für Organische Chemie, Universität Stuttgart

Hydrogels are three-dimensional networks of cross-linked hydrophilic polymers swollen in water. Their viscoelastic properties can be influenced by several parameters, such as the polymer and cross-linker content.
Herein, we present our results in the synthesis of novel cross-linkers for hydrogels. They consist of a neutral or positively charged core, alkyl spacers of varying length and terminal Michael acceptors. These molecules were utilised to cross-link natural or synthetic polymers such as hyaluronan or poly(acrylamide) via thio-Michael addition or radical polymerisation to form hydrogels. The influence of the cross-linker on the mechanical properties of the resulting hydrogels was studied.