

## **Abstract**

### **Pluronic Hydrogels as carrier materials for type II photooxygenation reactions**

20% (w/w) and higher concentrated solutions of block polymer Pluronic F127 form hydrogels that liquefy upon cooling, creating hydrophobic microdomains by expelling water molecules from the PPO core structures. A reaction protocol was developed that consists of dissolving an organic substrate in a cooled, liquid Pluronic solution, subsequent gelation process at room temperature and irradiation of the semi solid hydrogel. A part of this work features the investigation of the applicability of Pluronic F127 hydrogels as carrier materials for type II photooxygenation reactions. Motivation for this is the use of water or rather avoiding of harmful standard solvents like carbon tetrachloride or chloroform. Beyond that, the microdomain structure of Pluronic networks is investigated concerning regio- or diastereoselectivities, as seen before in the cases of microemulsions and constrained conditions like zeolites supercages.

### **Sugar-shell porphyrins as chiral core-shell triplet photosensitizers**

The synthesis and catalytic properties of sugar-substituted *meso-tetrakis*-tetraphenyl porphyrins is investigated. Sugar porphyrins are synthesized in a linear synthesis starting from protected sugar bromides. Their subsequently *para*-substituted sugar benzaldehydes are reacted with pyrrole to give the corresponding acetylated sugar porphyrins. The sensitizing porphyrin with chiral sugars surrounding it constitutes a core-shell structure, a catalytic setup that has led to enantioselective singlet oxygen photooxygenations in the recent time.

### **Nanosized sensitizers in type B photooxidations**

The sequence of singlet oxygen ene reaction starting with the monoterpene  $\alpha$ -pinene followed by a photoinduced one-pot azidohydroperoxidation has already been evaluated previously in this group. Functionalization of a double bond into an amino diol is available

with only two photochemical steps. Homo- and heterogeneous photocatalysts for a model azidohydroperoxidation reaction are to be tested and evaluated in terms of applicability and efficiency compared to classic PET molecular photosensitizers. A goal of this work is the completion of this functionalization concept starting from  $\beta$ -pinene, drawing special interest on the optimization of the azidohydroperoxidation key step using nanosized, heterogeneous semiconductors.