RESEARCH HIGHLIGHTS

Climate effects and limited resources discourage the continued reliance on petrochemical resources. In view of this, our research emphasizes on the conversion of renewable resources into new fine chemical products. Our focus is set on new bio surfactants based on carbohydrates and lipids and their subsequent utilization for both medical and technical applications. The research activities cover extensive chemical synthesis as well as a variety of physical studies. The complexity of carbohydrate analysis requires advanced NMR spectroscopy for structure elucidation.

The industrial focus currently aims on the design of cost effective surfactants [1,4] for water-in-oil emulsions and targets on so called ‘hydro-fuel’. The application of water in fuel can enhance the energy efficiency of engines, while reducing environmental pollution at the same time.

In the life-science sector our research activities target on a drug delivery system to reduce unwanted side effects of medications. Unlike traditional drugs, the approach emphasizes on receptor-based interactions of the exterior cell-membrane rather than differences in intracellular processes, thereby reflecting the vaccination concept: A cell toxic is encapsulated in a miniature cell-like carrier, called a vesicle, to deliver its content selectively to the target cell. The development of a vesicular drug delivery system involves aspects of formulation and physical studies on the assembly behavior of the surfactants. The key component, however, is the design and the chemical synthesis of the glycolipid surfactants.[2,3]

The receptor-based targeting of drug carriers can also be applied on nanoparticles, thereby enabling new applications for both medical diagnostic and potential therapy. Our research, therefore, also addresses the synthesis and chemical functionalization of inorganic nanoparticles for potential bio-applications.[5]