

## Abstract

In this thesis two biological systems were analyzed for the influence of stress situation with different physical-chemical methods.

The polysaccharide alginate is used as a model system to analyze the effects of dehydrations on extracellular polymeric substances. The biofilm of the bacterium *Deinococcus geothermalis* is first dehydrated and then rehydrated afterwards. Using the pulsed-field gradient nuclear magnetic resonance (PFG-NMR) method showed that two types of water with different self-diffusion coefficients are present in the biofilm matrix. Elasticity measurements indicated the formation of a protective skin which is formed as a survival strategy of the dehydrated biofilm.

For a cell membrane the integration of a foreign molecule is an extreme situation. To study this, lipopolysaccharide (LPS) of the bacterium *Escherichia coli* is inserted into a membrane consisting of phospholipid DMPC. Through nanoindentation and solid-state NMR experiments it can be shown that integration of LPS disturbs the mechanical stability of the cell membrane.

biofilm, *Deinococcus geothermalis*, elasticity, pulsed field gradient NMR, lipopolysaccharide, nanoindentation