Abstract:

The hydration and dynamics of the biomolecules appear to be vital for their proper biological functioning. In the presented thesis, various fluorescence techniques were developed and applied to access these properties and their changes upon the mutual interactions of the biomolecules. Initially, the solvent relaxation method based on recording time-dependent fluorescence shift (TDFS) was used to map DNA interactions with proteins and lipids by the newly synthesised fluorene dye covalently bound to the DNA. Secondly, copper-transporting ATPase was probed by Badan attached to the copper-binding cysteine-proline-cysteine motif. The variations in hydration were found to be crucial for the proper ATPase function. Third, a detailed study on quenching of Badan/Prodan fluorescence by tryptophan revealed the limitations of the TDFS method for protein studies, which is essential finding for further applications of TDFS. Fourth application involves investigations of heavy atom effects on the excited state relaxation processes by up-conversion approach in iodinated metallocorroles, which are promising dyes for biological imaging. The obtained findings shall help in further tuning of the optical properties of the corroles desired for the variety of applications. Finally, fluorescence correlation spectroscopy revealed surprising cooperation effects during the incorporation of two antimicrobial peptides, PGLa and Mag2, into the membrane.