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The coupling of proton and electron transfer in membrane proteins studied by electrochemistry and vibrational spectroscopies



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Energy supply mechanisms are central to life and living cells and are in focus of our research. Although the architectures of several membrane proteins in respiration and photosynthesis as well as the basic chemical reactions have been described, the interactions on molecular level, the curiously high diversity of mechanisms and their high efficiency, need to be clarified.

In order to understand the molecular basis of energy transduction, experiments have been developed which reveal how protons, other ions and water molecules are drawn through proteins and how they are coupled to electron transfer. A combined electrochemical, Raman and infrared spectroscopic approach was used for the determination of the pK value of crucial amino acid side chains and for the study of the structural, dynamic and energetic requirements for the proton transferring groups in the proton or sodium pumping enzymes and the cofactor sites that rule them.^[1-4] The techniques enable the observation of protein action at the level of single functional groups within large proteins and thus provide essential knowledge's for the understanding of the mechanism of the studied enzymes. The identification of specific sites in proton and sodium pumping enzymes from respiration will be presented.

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