BIOENERGETIC PROTONS AND BIO-H_2 PRODUCTION

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Abstract

Understanding of proton transfer reactions along the cellular membrane is of fundamental importance for bioenergetics. The purple membrane of Halobacteria represents a sufficiently simple system to study lateral proton transfer with the help of judiciously placed pH-indicators along the surface of bacteriorhodopsin. Active proton transfer across bacteriorhodopsin is observable by time-resolved FT-IR spectroscopy. Examples will be provided that illustrate how single proton transfer events can be traced in time and space[1,2].

As a methodological advance, we have recently developed Surface Enhanced Infrared Difference Absorption Spectroscopy (SEIDAS)[3] to probe potential-induced structural changes of a protein on the level of a monolayer. A novel concept is introduced to incorporate membrane proteins into solid supported lipid bilayers in an orientated way via the affinity of the His-tag to the Ni-NTA terminated gold surface[4]. Full functionality of the surface tethered cytochrome c oxidase is demonstrated by cyclic voltammetry after binding of the natural electron donor cytochrome c. General applicability of the methodological approach is shown by tethering photosystem II to the gold surface[5]. In conjunction with hydrogenase, the basis is set towards a biomimetic system for H_2-production.

References

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