

Biomimetic assembly of a photocatalytic unit for hydrogen production (extension)

Initiative: Integration molekularer Komponenten in funktionale makroskopische Systeme (beendet, nur noch

Fortsetzungsanträge)

Bewilligung: 02.12.2013

Laufzeit: 3 Jahre

Projekt-Website: <https://www.ruhr-uni-bochum.de/pbt/>

The present proposal aims at designing of novel molecular devices for the light-driven production of hydrogen gas. The described strategies are based on two innovative approaches that have recently been established in the Happe group. The first procedure is based on the successful electrochemical linkage of two redox proteins via a dithiole linker compound. The second advance enables the spontaneous in vitro activation of [FeFe]-hydrogenases by adding an inorganic iron-sulfur mimic (2FeH) to the inactive precursor protein. Both methods will be employed to achieve the following objectives in the field of light-induced hydrogen production: a) Wiring metal free artificial photosensitizer molecules to a semi-artificial hydrogenase. b) Remodeling the natural FA/FB-cluster assembly of a bacterial ferredoxin and the photosystem I unit PsaC to incorporate and functionalize the 2FeH mimic compound for yielding new types of H₂ evolving catalysts. On the basis of this innovative interdisciplinary approach one can expect to establish a platform on which synthetic protein environments can be developed and studied, allowing a collaboration of biologists and chemists with the aim of developing truly artificial H₂-generating units.

Projektbeteiligte

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[FeFe]-Hydrogenase with Chalcogenide Substitutions at the H-Cluster Maintains Full H Evolution Activity.

Electrochemical Investigations of the Mechanism of Assembly of the Active-site H-Cluster of [FeFe]-hydrogenases.

Sunlight dependent hydrogen production by photosensitizer - hydrogenase systems.

Accumulating the hydride state in the catalytic cycle of [FeFe]-Hydrogenases

Interplay between CN-ligands and the secondary coordination sphere of the H-Cluster in [FeFe]-hydrogenases

