The mechanism of water splitting in PS II investigated by X-ray crystallography and spectroscopy

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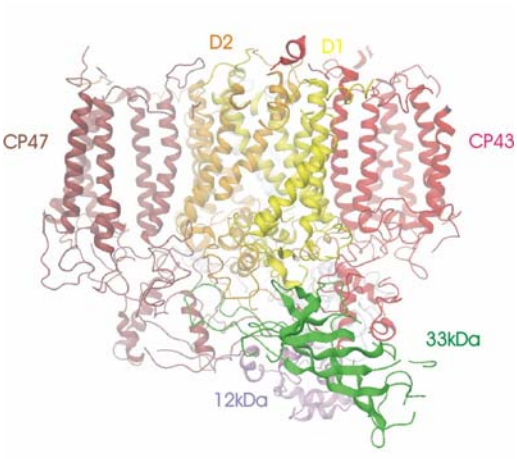
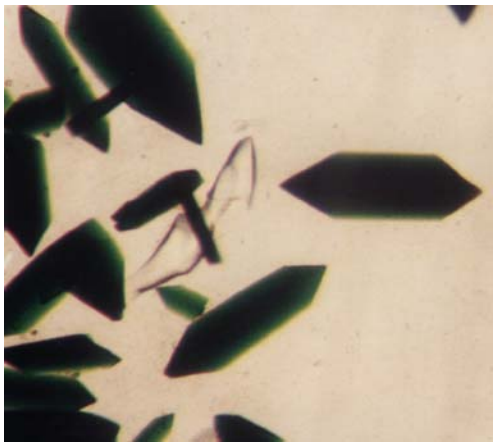
Metals play an important role in biocatalysis, more than 20% of all enzymes contain metals in their catalytic centers. One of the most important biometal-catalyzed reactions reactions on earth is the oxidation of water and release of water catalyzed by the oxygen-evolving complex in Photosystem II. Photosystem II produces all the oxygen in the atmosphere, which humans and animals use as energy supply by respiration. Photosystem II is a large membrane protein complex embedded in the photosynthetic membrane consisting of 17 proteins to which more than 50 cofactors are bound to perform the complex reactions of light capturing, charge separation and water oxidation.

This project has the main goal to determine the structure of Photosystem II at atomic resolution and to elucidate the mechanism of water oxidation by the tetra-nuclear manganese cluster.
The physical-chemical parameters of the crystallization process will be determined and the improved crystals will serve as the basis for the determination of the structure of Photosystem II by X-ray crystallography.



Structure of Photosystem II at 3.6 Å resolution



Photosystem II crystals

The electronic structure of the cofactors that are involved in water oxidation will be investigated by spectroscopic investigations using different Electron Paramagnetic Resonance (EPR) techniques on single crystals of Photosystem II. The final goal is to unravel the secrets of the mechanism of water oxidation by Photosystem II based on the structural and functional investigations.

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