

## Solar Fuels : from natural to artificial photosynthesis - chemistry for the production of hydrogen from solar energy and water

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The paper will discuss the need for Solar Fuels and overview the different scientific paths to achieve this goal. Visions and strategies in research in the Swedish Consortium for Artificial Photosynthesis and the European network SOLAR-H2 will be covered. Our research aims for the production of hydrogen from solar energy and water. Water shall be oxidized in a catalytic process using solar energy. The electrons from water shall be used in a second process to reduce protons to hydrogen. We apply a biomimetic approach where we copy key principles from natural enzymes that accomplish partial reactions. Water oxidation using solar energy is carried out by Photosystem II using a catalytic Mn<sub>4</sub> complex. In our chemistry we also develop Mn-based catalytic systems and use a photoactive Ru-center to drive oxidative electron transfer. I will describe our recent research on light driven, multi-electron transfer in these Mn systems and a recent water oxidizing catalyst based on a cobalt nano-particle. To accomplish reduction of protons to hydrogen we mimic the di-iron center in hydrogenase enzymes. Some recent results on these biomimetic Fe-Fe complexes will be described.

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**Primary author:** Prof. STYRING, Stenbjörn (Photochemistry and Molecular Science, Department for Chemistry – Ångström laboratory. The Ångström Laboratory, Uppsala University, Sweden)

**Presenter:** Prof. STYRING, Stenbjörn (Photochemistry and Molecular Science, Department for Chemistry – Ångström laboratory. The Ångström Laboratory, Uppsala University, Sweden)

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