Energy from sunlight: Further steps towards artificial photosynthesis

June 24 2016

Chemists from the Universities of Basel and Zurich have come one step closer to generating energy from sunlight: for the first time, they were able to reproduce one of the crucial phases of natural photosynthesis with artificial molecules. Their results have been published by the journal *Angewandte Chemie* (international edition).

Green plants are able to temporarily store electric charges after the absorption of sunlight by using a so-called molecular charge accumulator. The two research teams were able to observe this process in artificial molecules that they created specifically for this experiment.

Two charges stored shortly

The chemists excited the artificial molecules using a laser, which then made it possible to store two negative charges for a short time span for the very first time. They succeeded in storing the charges long enough, namely for 870 nanoseconds, thus making them effectively usable for artificial photosynthesis.

Importantly, the investigators carried out the charge accumulation without employing any sacrificial reagents. So far, charge accumulations in artificial molecules had only been possible using such sacrificial reagents. Large amounts of energy had to be used for these, which made a sustainable conversion of sunlight into chemically stored energy impossible.

"Our results represent a fundamental and important step on the path to artificial photosynthesis", say Prof. Oliver Wenger (University of Basel) and Prof. Peter Hamm (University of Zurich), who jointly led the study. However, they claim, it is still a long way to go until the aspired sustainable application will become reality.

Conversion into fuel

The two research groups of the Universities of Basel and Zurich are currently investigating how the charge accumulation can be converted into a chemical fuel. As an inspiration, they look at green plants, which use charge accumulation to build vital, energy-rich substances. Artificial photosynthesis is considered a promising element of a sustainable future energy supply.

More information: M. Orazietti, M. Kuss-Petermann, P. Hamm, O. S. Wenger; Light-Driven Electron Accumulation in a Molecular Pentad; *Angew. Chem. Int. Ed.* (2016); DOI: 10.1002/anie.201604030

Provided by University of Basel