AKE 12: Artificial Photosynthesis, CO2-Reduction

Time: Wednesday 15:15–16:00 Location: U A-Esch 1

Invited Talk AKE 12.1 Wed 15:15 U A-Esch 1

Photocatalysis - a powerful tool for the generation of Sun Fuels from Water and Carbon Dioxide? — •Henrik Junge — Leibniz-Institut für Katalyse e.V. an der Universität Rostock

One of the central challenges of the next decades is the sufficient and sustainable supply of energy. The conversion of the almost unlimited available energy of sunlight into stored chemical energy by means of photo- or electrocatalytic water splitting into oxygen and hydrogen is a benign objective. Besides hydrogen, further value added products like e.g. carbon monoxide, formic acid, methanol or methane are of special interest. While multistep processes, consisting of a wind power plant or photovoltaic cells, an electrolysis cell and carbon dioxide hydrogenation to form these products are available at least at a small scale, the development of a one step process is pending and basic research is still necessary. Nevertheless, some significant progress has been already achieved. Due to lower costs, the replacement of noble metal catalysts by cheap 3d metals like iron, nickel and cobalt is of special interest for these fields. Within the presentation various relevant examples of catalyst development for these topics will be provided.

AKE 12.2 Wed 15:45 U A-Esch 1

Photoelectrochemical CO_2 reduction as a negative emission technology — •Matthias M. May[1] and Kira Rehfeld[2] — [1]Helmholtz-Zentrum Berlin, Institute for Solar Fuels — [2]Universität Heidelberg, Institute of Environmental Physics

Current CO_2 emission rates are incompatible with the 2°C target for global warming. Negative emission technologies are therefore an important, but also controversial basis for climate policy scenarios. For this, energy is actively invested for the removal of dilute CO_2 from the atmosphere, followed by sequestration. We show that photoelectrochemical CO_2 reduction might be a viable, high-efficiency alternative to biomass-based approaches, which reduces competition for arable land [1]. To develop them, electrochemical reactions have to be optimised for CO_2 removal. This deviates from energetic efficiency optimisation in solar fuel applications and hence renders different carbon sink products attractive. Here, we discuss efficiency limitations of the approach.

[1] May and Rehfeld, Earth Syst. Dynam. Discuss., in review, 2018, DOI:10.5194/esd-2018-53.