

AKE 4: Solid State based Artificial Photosynthesis

Time: Monday 14:30–15:00

Location: B 0.014

Invited Talk

AKE 4.1 Mon 14:30 B 0.014

Solid State Photoelectrochemical Devices for Artificial Photosynthesis: State-of-the-Art and Perspectives — ●ROEL VAN DE KROL — Helmholtz-Zentrum Berlin für Materialien und Energie GmbH, Berlin, Germany — Technische Universität Berlin, Institut für Chemie, Berlin, Germany

The direct photo-electrochemical conversion of water and or CO₂ into chemical fuels represents an exciting new pathway for the combined conversion and storage of solar energy. I will give a brief overview of the recent efforts on solar water splitting, and discuss three important challenges in the field. The first challenge is to find semiconducting light absorbers that are efficient, chemically stable, and easy to synthesize. Our efforts focus on complex oxide semiconductors, such

as BiVO₄ and CuBi₂O₄. I will discuss how novel doping strategies can be used to enhance the charge separation in these materials, and show how ultrafast time-resolved spectroscopy can help to improve our understanding of the carrier dynamics. The second challenge is to enhance the electrochemical reaction kinetics, which is typically done by modifying semiconductor surfaces with electrocatalysts. Our understanding of the semiconductor/electrocatalyst interface is, however, still far from complete. Operando photoemission techniques can help us to get better insights in how solid/liquid interfaces behave under illumination. A third challenge is scale-up to large(r) areas, which I will illustrate with results on a 50 cm² BiVO₄-based solar fuel device for water splitting that was recently developed within the EU project PECDEMO.