Natural Water to Hydrogen

Date: 30th January, 2025, 2:00 pm

Venue: NETZ, Ground Floor, Room – 0.03
Carl-Benz-Straße 199, 47057 Duisburg

Invited speaker

Prof. Erwin Reisner

Department of Chemistry, University of Cambridge
Royal Academy of Engineering Chair in Emerging Technologies

Erwin Reisner, Professor of Energy and Sustainability at the University of Cambridge, is a globally recognized expert in renewable energy and sustainable chemistry. His research focuses on solar-driven technologies for green fuel and chemical production, including artificial photosynthesis and solar reforming of carbon dioxide, biomass, and plastic waste. By integrating synthetic and biological catalysts with photovoltaic systems, his team has developed groundbreaking solar-powered devices. Erwin Reisner has secured major grants like ERC Advanced Grants and a Royal Academy of Engineering Chair, founded the start-up Protonera, and received honors such as the Hughes Medal (2023) and Tilden Prize (2024). His contributions bridge science and industry, advancing solar chemistry for a sustainable, net-zero future while showcasing the potential of circular chemical technologies.

Solar Chemical Technologies

Abstract

The design and construction of prototype solar devices for the direct valorisation of carbon dioxide, biomass and plastic waste streams into renewable fuels and higher-value chemicals will be presented. Standalone photoelectrochemical cells and artificial leaves based on integrated semiconductors with immobilised synthetic and biological electrocatalysts have been created for solar-powered CO_2 reduction to produce syngas (CO and H_2), formate or ethanol fuel coupled to O_2 evolution from water oxidation. Photocatalyst sheets assembled from immobilised semiconductor powders decorated with (bio)molecular catalysts can cleanly produce formate and acetate from CO_2. Replacing water oxidation in traditional artificial photosynthesis by waste oxidation provides thermodynamic, kinetic and economic advantages. This solar reforming approach can readily couple CO_2 reduction, including atmospheric CO_2, with biomass and plastic waste up-cycling using semiconductor particles and photoelectrochemical devices. Thus, the concept and prospect of integrated solar chemistry for artificial photosynthesis and solar reforming will be discussed, including an outlook on advanced strategies to improve light management in such device architectures with the ultimate goal to achieve superior performance than indirectly coupled photovoltaic-electrolyser technology. More information: http://www-reisner.ch.cam.ac.uk/

ZWU ZENTRUM FÜR WASSER- UND UMWELTFORSCHUNG
CENIDE CENTER FOR NANOINTEGRATION DUISBURG ESSEN
NETZ NANOENERGIE TECHNIKZENTRUM
ACTIVE SITES