

TUM CRC DLS Vortragsreihe SoSe 2026

Prof. Erwin Reisner

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Solar Chemical Technologies

**Montag, 28. September 2026, 17.00 Uhr
TUM Institute for Advanced Study (IAS)
Lichtenbergstr. 2 a, 85748 Garching
Auditorium EG 0.001**

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Inspired by the blueprint of photosynthesis, creating synthetic systems for the direct conversion of sunlight into sustainable fuels has long been a defining ambition of chemistry. While decades of research have been spent on developing solar water splitting catalysts to produce green hydrogen, recently a new generation of photosynthesis-inspired architectures capable of directly converting sunlight, carbon dioxide and carbon waste streams has emerged. This advance in solar waste carbon upcycling has been made possible by developing and integrating metal complex and biological catalysts with semiconductor materials and electrodes, together with engineering of bespoke devices. This lecture will first introduce functional mimics of photosynthesis, which couple semiconductor light absorbers with immobilized (bio)catalysts to achieve solar-driven carbon dioxide fixation alongside water oxidation to oxygen. Next, an alternative strategy will be presented that replaces the challenging water oxidation reaction by the oxidation of waste biomass and plastics. This concept, termed solar reforming, simultaneously improves reaction thermodynamics, enhances overall rate of catalysis, and creates economic value through oxidative valorization while simultaneously generating clean fuel. The demonstration of outdoor solar plastic reforming at the kilogram and square-metre scale illustrates the growing potential of this approach as a practical route towards circular solar-powered manufacturing. The lecture will close by giving an overview of emerging frontiers in integrated solar chemistry, including atmospheric utilization, advanced light-management strategies, and solar-powered cascade catalysis for selective chemical organic synthesis. Together, this presentation aims to provide a compelling vision for a new generation of solar technologies that combine carbon capture, plastic and biomass waste valorization, and renewable chemical manufacturing in integrated, scalable systems.

Bio: Erwin Reisner is the Professor of Energy and Sustainability and Royal Academy of Engineering Chair in Emerging Technologies in the Yusuf Hamied Department of Chemistry at the University of Cambridge. He is an expert in renewable energy technologies and sustainable chemistry, in particular the sunlight-powered production of sustainable fuels and platform chemicals. His cross-disciplinary research into solar chemistry and circular chemical technologies focuses on the capture and utilization of the greenhouse gas carbon dioxide as well as the valorization of plastics and biomass waste to produce green fuels and chemicals for a net zero future. More information is available at the website of Professor Reisner's laboratory: <https://www-reisner.ch.cam.ac.uk>



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