



MateriALZ Seminar Series

Bridging energy conversion and storage in two-dimensional molecular frameworks

Friday, April 23, 2021, 11:00 am Phoenix Time

Abstract

Transitioning towards a sustainable energy economy is contingent on new materials solutions. Due to their earth-abundance and low cost, carbon-based materials have become the backbone of a variety of sustainable energy technologies ranging from photovoltaics to supercapacitors. While many carbon materials lack structural definition, 2D frameworks such as carbon nitrides and covalent organic frameworks (COFs) are molecularly precise, crystalline and porous, and as such have the potential to put a new spin on the development of well-defined and robust metal-free semiconductors for photocatalysis.

In this talk, we will discuss recent developments and challenges lying ahead in the emerging field of “soft photocatalysis” using 2D frameworks as photoabsorbers, with a focus on the hydrogen evolution reaction. We will then explore the rich interface between optoelectronic and optoionic properties in ionic poly(heptazine imide)-type carbon nitrides (PHI), which represent a new generation of “light storing” materials. The intricate interplay between light harvesting and charge storage in PHI will be exemplified by the concepts of “dark photocatalysis” and direct solar batteries. Finally, we will showcase the design of light-driven microswimmers with photocapacitive properties, building a bridge between energy converting and autonomous systems.

Prof. Bettina Lotsch

Max-Planck-Institut für Festkörperforschung

Bettina Lotsch is the Director of the Nanochemistry Department at the Max Planck Institute for Solid State Research (MPI-FKF) in Stuttgart, Germany. She studied Chemistry at the Ludwig-Maximilians-Universität München (LMU) and the University of Oxford and received her PhD from LMU Munich in 2006. After a postdoctoral stay at the University of Toronto she became professor at LMU Munich in 2009 and was appointed Director at MPI-FKF in 2017. She also holds honorary professorships at LMU Munich and the University of Stuttgart. Bettina’s research explores the rational synthesis of new materials by combining the tools of molecular, solid-state and nanochemistry. She was awarded an ERC Starting Grant (2014) and has been elected a Fellow of the Royal Society of Chemistry in 2014. Her work has been recognized by a number of awards, including the EU-40 Materials Prize 2017 of the European Materials Research Society.



Zoom link: <https://asu.zoom.us/j/81425609410>