NECEM WEBINAR: The quest for mechanistic insight: light matter interactions in hybrid materials designed for multi-electron transfer reactions

Professor Maria Abrahamsson, Chalmers University of Technology, Sweden

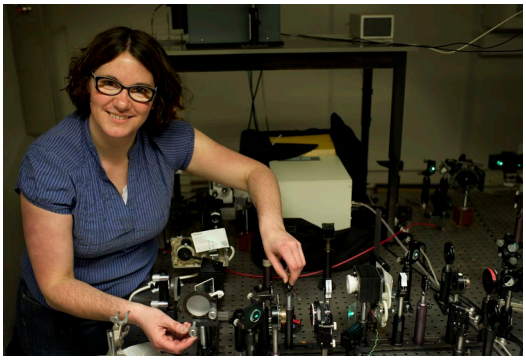
Wednesday 10th June 2020, 2-3 pm (UK)

Via Zoom email: justina.heslop@newcastle.ac.uk to join.

Photoinduced multielectron transfer reactions are of fundamental interest to many chemists and also a prerequisite for solar fuels generation. However, achieving high yields remains an unsolved challenge, and it has been hypothesized that detrimental back electron transfer reactions may be the cause of low overall efficiencies. Thus we need to control both forward and back electron transfer rates, and understand what governs different electron transfer mechanisms.

To some extent rates can be tuned by molecular design; molecules typically provide excellent selectivity. However, many actual applications require solid state materials, and a material-oriented approach is often favorable to stabilize the highly reduced states generated in multi-electron transfer processes. Here, two examples where the selectivity of molecules is maintained while still taking steps towards solid state materials. Furthermore, the potential use of patterned dye sensitized mixed-semiconductor thin films in multi-electron transfer processes will be discussed. We have shown that using these types of films results in at least a factor of ca 50 longer-lived charge separated state compared to a single semiconductor thin film. Furthermore, we prove conduction band mediated electron transfer to a catalyst, and preliminary results indicate that we may have a two-electron transfer process.

Biography



Maria Abrahamsson is professor of physical chemistry at Chalmers university of technology. She did her graduate work on design and spectroscopic characterization of functional photosensitizers within the framework of the Swedish consortium for artificial photosynthesis and obtained her PhD in physical chemistry from Uppsala University in 2006. In 2007 she joined the group of Gerald J. Meyer at Johns Hopkins University in Baltimore, United States, working on fundamental aspects of dye sensitized solar cells. In 2010 she joined

the faculty as an assistant professor at Chalmers where she has developed a research program on design and characterization of hybrid materials, aiming at control of model multielectron transfer reactions as well as societal relevant catalytic reactions. She was promoted to associate professor in 2015 and professor in 2020. Since 2019 she is also the director of the materials science area of advance at Chalmers.