

MRS Fall meeting

Start Time: Sunday, December 1, 2019 09:00 am

End Time: Friday, December 6, 2019 05:00 pm

Boston, Massachusetts

We are delighted to announce the symposium

„Development in Catalytic Materials for Sustainable Energy—Bridging the Homogeneous/Heterogeneous Divide”

which takes place during the MRS fall meeting Dec 1-6 2019 in Boston, USA. The call for abstracts opens May 13 2019 and closes June 13 2019

More details are found on the [web page](#)

Symposium EN06—Development in Catalytic Materials for Sustainable Energy—Bridging the Homogeneous/Heterogeneous Divide

Addressing the challenge of generating useful forms of energy from abundant but practically unfeasible reagents (i.e. H_2O , CO_2 , N_2 , light) requires the precise control of many thermodynamically and kinetically difficult reactions. Making these transformations effective and efficient demands the development of selective, active, durable and low-cost catalysts to overcome sluggish kinetics, steer the myriad possible reaction pathways, and lead to desirable products in high yields. Catalysts that do enable these transformations can be generally categorized as homogeneous or heterogeneous, with each set possessing its own unique advantages and disadvantages. Homogeneous catalysts, mostly molecules, possess well-defined structures on the atomic level that enable rational design and mechanism-based optimization but often suffer from issues of low stability. Heterogeneous catalysts, mostly inorganic solids, are compatible with most energy storage and conversion devices and are easy to handle, but possess diverse and often dynamic active sites that are difficult to characterize to atomic accuracy. While development in these two areas has typically been disconnected from each other, there has recently been notable progress in the development of catalytic materials crossing the homogeneous-heterogeneous boundary. Specifically, research on heterogeneous

catalysis has been seeking for molecular-level understanding of structure-reactivity correlations, with the help of newly-developed advanced characterization techniques and computational simulations. Also, research on homogeneous catalysis has evolved to constructing practical catalysts by supporting or anchoring molecules on surfaces. And to obtain the best features of both classes, research toward new catalytic materials which integrate the features of traditional molecular catalysts with heterogeneous materials catalysts (e.g. heterogenized molecular catalysts, single atom catalysts) have been emerging. This symposium is aimed at capturing this progress at the interface of homogeneous and heterogeneous catalysis and connecting researchers in multiple disciplines to discuss the overarching theme of catalytic materials research for energy innovations.

Topics will include:

- Molecular catalysts
- Single-atom catalyst materials
- Nanoparticle catalyst materials
- Materials design crossing the homogeneous-heterogeneous boundary
- Cooperative catalysis enabled by multi-component material structures
- Electro- and photocatalytic activation and conversion of small molecules including water, hydrogen, oxygen, carbon dioxide, nitrogen, and hydrocarbons
- Mechanistic studies via advanced characterization and computational simulation

Invited Speakers:

- **Gary Brudvig** (Yale University, USA)
- **Cyrille Costentin** (Université Paris Diderot, France)
- **Beatriz Roldan Cuenya** (Fritz Haber Institute of Max Planck Society, Germany)
- **Jared Delcamp** (University of Mississippi, USA)
- **Fabio Dionigi** (Technical University Berlin, Germany)
- **Maria Flytzani-Stephanopoulos** (Tufts University, USA)
- **Joseph Hupp** (Northwestern University, USA)
- **Erwin Reisner** (Cambridge University, United Kingdom)
- **Jan Rossmeisl** (University of Copenhagen, Denmark)
- **Ted Sargent** (University of Toronto, Canada)
- **Yang Shao-Horn** (Massachusetts Institute of Technology, USA)
- **Staff Sheehan** (Catalytic Innovations LLC, USA)
- **Ifan Stephens** (Imperial College London, United Kingdom)
- **David Tiede** (Argonne National Laboratory, USA)

- **Xin Wang** (Nanyang Technological University, Singapore)
- **Shihe Yang** (Hong Kong University of Science and Technology, China)

Peter Strasser, Technical University of Berlin, Germany and others

Organizer