

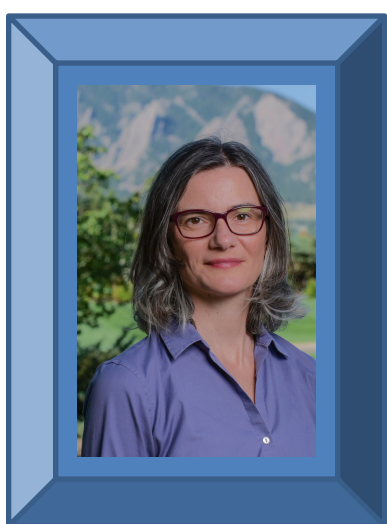


RENEWABLE AND SUSTAINABLE ENERGY INSTITUTE

BIG energy seminar series

Addressing global energy challenges in scale and complexity.

Elucidating how photoexcited semiconductor nanocrystals drive multi-electron redox catalysis



Gordana Dukovic, PhD

University of Colorado Boulder, Department of Chemistry, Renewable and Sustainable Energy Institute, and Materials Science and Engineering

Date: December 6, 2022 at 4pm-5pm

Location: SEEC Building, S228 Sievers Room

Abstract:

Colloidal semiconductor nanocrystals are remarkably versatile materials with highly tunable electronic structure, optical spectra, and surface properties. My research group works on the photophysics and photochemistry of nanoscale semiconductors with a particular emphasis on light-driven processes involved in multi-electron redox reactions relevant for renewable and sustainable chemical transformations. I will discuss coupling of semiconductor nanocrystals with redox enzymes to photochemically drive reactions such as reduction of H^+ to H_2 , N_2 fixation to make NH_3 , and carbon-carbon bond formation. Using time-resolved spectroscopy over a broad range of timescales (100 fs – 10 μ s), in conjunction with kinetic modeling, we examine charge transfer between photoexcited nanocrystals and enzymes to identify structural and chemical parameters that govern the overall photochemical reactivity. I will also describe the dynamics of photoexcited holes in nanocrystals and the implications of those dynamics on oxidation photochemistry. In particular, I will discuss the spatial dynamics of trapped holes on nanocrystal surfaces and the consequences of their behavior on charge transfer.

Bio:

Gordana Dukovic is a professor of chemistry and materials science and engineering and a fellow and associate director of the Renewable and Sustainable Energy Institute at the University of Colorado Boulder. Her research focuses on structure, excited state properties, and light-driven chemistry of nanoscale materials. She received a PhD in chemistry from Columbia University in 2006 and carried out postdoctoral research at the University of California Berkeley (2006-2009). She has received the NSF CAREER Award, and was named a Sloan Research Fellow, a Cottrell Scholar, a Beckman Young Investigator, and a Finalist for the Blavatnik National Award for Young Scientists.

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