



Biosketch: Ksenija D. Glusac received her academic training from the following institutions:

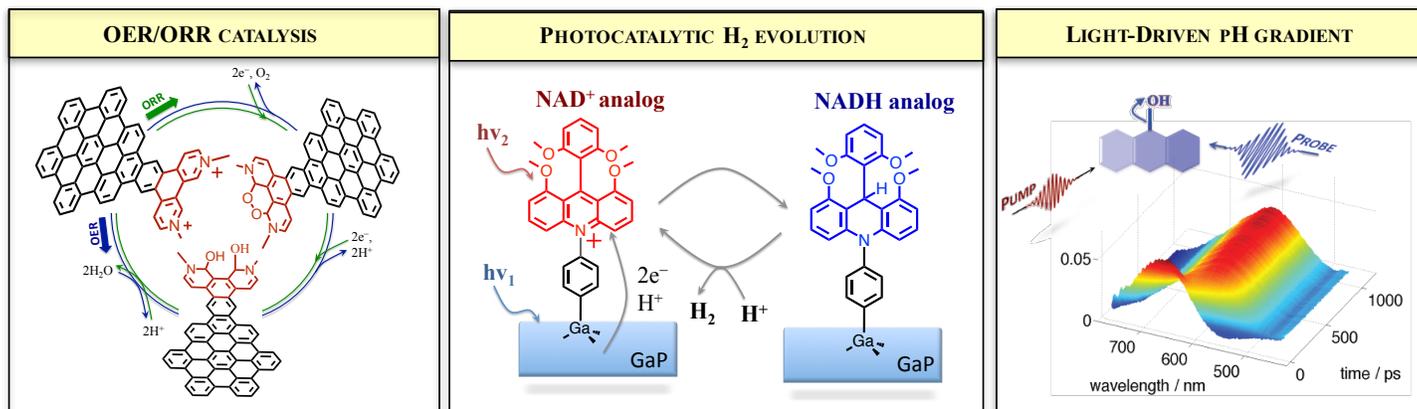
- B.S. from University of Belgrade, Serbia (1999; Mentor: Prof. Radomir Saicic; Thesis: Syntheses of Model Taxol Derivatives);
- Ph.D. from University of Florida, USA (2004; Mentor: Prof. Kirk S. Schanze; Thesis: Delocalization and Migration of Triplet States in Pt-acetylide Oligomers);
- Postdoctoral training from Stanford University, USA (2006; Mentor: Prof. Michael D. Fayer; Topic: Electron Transfer Dynamics in Restricted Media Using Ultrafast Spectroscopy).

Ksenija started her independent research career at Bowling Green State University in 2006, where she is currently an Associate Professor of Chemistry and a member of the Center for Photochemical Sciences. The Glusac group research focuses on molecular models for organocatalytic fuel-forming reactions, such as organic molecular motifs for solar fuel applications. These projects are funded by NSF and ACS/PRF. Ksenija's research has been acknowledged by the following awards: (i) BGSU Outstanding Young Scholar Award, 2012; (ii) NSF CAREER Award, 2011-2016; (iii) ACS PRF Postdoctoral Fellowship, 2004-2006; (iv) Jones Award for Creativity and Originality, 2002.

Seminar Title: In Search for Metal-free Catalytic Motifs for Solar Fuels

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We study conceptually new catalytic approaches for solar fuel-forming reactions. The mainstream research in this area explores transition metal oxides and complexes to catalyze O_2 and H_2 evolution. These catalysts are often made of rare and toxic metals, which disables their wide usage. To provide less expensive and more environmentally friendly alternatives for catalytic water splitting, we aim to discover earth-abundant catalytic motifs that utilize solely organic compounds made of C, H, N and O.



Three projects are currently under investigation in our labs: (i) Electrocatalytic water oxidation by N-containing heteroaromatic cations. Our preliminary results showed that a simple, flavin-based model compound catalyzes the water oxidation at large overpotentials and with the assistance of the working electrode's surface. Since further mechanistic studies of this novel flavin-based system are complicated by the interfacial chemistry, we are searching for fully homogeneous analogs of the flavin-based catalyst. This presentation summarizes our progress towards these homogeneous models; (ii) Photochemical reductions using NAD⁺/NADH analogs. The organic molecular framework serves both as a dye sensitizer (NAD⁺ analog) and as the fuel-forming electrocatalyst (NADH analog). Our preliminary kinetic studies using ultrafast pump-probe spectroscopy on a series of NAD⁺ analogs suggest that the hole injection into the inorganic semiconductor (GaP) occurs efficiently with dyes that have sufficiently long excited-state lifetimes. In addition, the hydricities of a series of NADH analogs were evaluated, showing that some of the model compounds investigated are excellent hydride donors. (ii) Light-triggered pH gradient. This long-term aim of this project is to develop light-triggered pH membranes that could be used in electrochemical cells and other applications. As a first step in this direction, we investigated the photochemical OH^- release from a series of model photobases. The intrinsic activation barriers were evaluated and compared to those observed by us and others in photoacids. The results show that the excited-state OH^- release is feasible, but slower than the H^+ release.