MECHANICAL & INDUSTRIAL ENGINEERING SEMINAR

FALL 2016 SEMESTER: ME 794-001

Renewable and Alternative Energy Sources for the Production of Chemicals and Fuels

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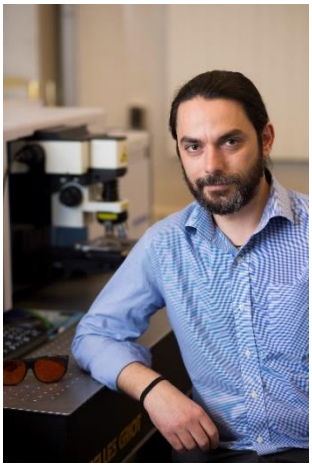
MEC 221 LECTURE HALL ROOM
1:00 – 2:25PM

Abstract:
Catalysis lies at the heart of the chemical industry and could be considered as the society's gateway to the sustainable and petroleum-free future for fuel and chemical production. While the energy needs of the developed world are currently over-dependent on the utilization of finite resources in conjunction with the recurring uncertainty in the price of crude oil, research efforts are markedly shifting the overall picture towards processes that use alternative or renewable sources (such as biomass and natural gas) for the production of fuels and chemicals. In this context, this talk will be mainly focused on the crucial topic of solvent effects on biomass applications and specifically on the reactivity and overall stability of value-added biomass derived chemicals such as 5-hydroxy-methyl-furfural (HMF). A case study of aqueous dimethyl sulfoxide (DMSO) reaction media will be discussed based on kinetic and isotopic labeling experiments. Emphasis will be placed on how vibrational spectroscopy can be utilized for unravelling solvent-solute interactions at the molecular level. To this end, it will be presented an approach that allow us to monitor the interaction between specific functional groups and solvent molecules providing insights into solvation effects that apply also to other mixed solvent systems. Besides biomass systems, structure-function relationships of supported metal oxide catalysts, acquired by means of *in* situ and operando vibrational spectroscopy will be briefly presented to illustrate how combining spectroscopic studies with reactivity measurements can contribute to overcoming future challenges in the field of general catalysis.



Biography:
George Tsilomelekis is an Assistant Professor at the Chemical and Biochemical Engineering Department at Rutgers, The State University of New Jersey. Dr. Tsilomelekis, received his Diploma in Chemical Engineering in 2006 from the University of Patras, Greece. In 2011, he got a Masters in Energy and Environment as well as his PhD in Chemical Engineering from the same institution. As a PhD candidate, George Tsilomelekis focused on the establishment of structure-activity relationships for the oxidative dehydrogenation of alkanes through the rational implementation of vibrational spectroscopies under realistic reaction conditions (Operando spectroscopy) and isotopic labeling experiments. In 2012, he joined as a postdoctoral researcher the Catalysis Center for Energy Innovation and the Department of Chemical and Biomolecular Engineering at the University of Delaware, where he conducted research on the critical topic of solvent effects in biomass processing. His research activity and interests focus on the development and utilization of various spectroscopic methods toward understanding complex catalytic reactions in the broad field of the conversion of renewable and alternative energy sources.

For More Information Contact: Prof. Eon Soo Lee, eonsoo.lee@njit.edu