Quantum Cascade Lasers

Bandgap engineering is a very powerful technique for the design of novel semiconductor devices. Individual control of material composition (band gap), thickness and doping level for each layer in a heterostructure offers unprecedented flexibility in optimizing device characteristics to a particular application. Band engineering will be discussed in the context of quantum cascade lasers, or QCLs. Current research trends in the QCL field will be covered.

Dr. Lyakh’s research interests are physics of intersubband transitions and carrier transport through multilayered semiconductor structures, low-dimensional semiconductor devices and infrared spectroscopy. His group has recently demonstrated a number of critical advances, including setting a world record in QCL efficiency, the first demonstration of power scaling with lateral active region dimensions and the development of monolithic QCLs on silicon.

Reducing Our Reliance on Fossil Fuels by Electrochemical Fuel Synthesis

Because of the limited reserves of fossil fuels, there is an urgent need to develop renewable energy technologies that can reduce our reliance on fossil fuels. One promising strategy is to power the synthesis of fuels and chemicals from naturally abundant resources using renewable energy, such as solar- or wind-generated electricity. Dr. Feng will discuss these electrochemical energy conversion processes, particularly the conversion of CO\textsubscript{2} to fuels such as ethanol as well as the reduction of N\textsubscript{2} to ammonia, both under ambient conditions.

Dr. Feng’s research focuses on electrochemical catalysis for renewable energy conversion. He received his Ph.D. in materials science and engineering from the University of California, Berkeley in 2013. He was a postdoctoral scholar in the Department of Chemistry at Stanford University before joining UCF in 2016. While at UCF, he received a Sloan Research Fellowship, an ACS Petroleum Research Fund Doctoral New Investigator Award, an NSF CAREER Award and a UCF Research Incentive Award.