UC San Diego
JACOBS SCHOOL OF ENGINEERING
NanoEngineering

UC SAN DIEGO NANOENGINEERING SEMINAR

Wednesday, May 23, 2018
Seminar Presentation: 11:00am – 12:00pm
ASML Conference Center (SME 248)

"Light-Emitting Devices with Ionic Materials"

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Abstract: In this talk, new light-emitting devices that operate based on electro-generated chemiluminescence or electrochemiluminescence (ECL) will be introduced. ECL is a process that results in light-emission upon the charge transfer reaction between a chemically reduced and a chemically oxidized species. This process has been a widely utilized tool in analytical electrochemistry over the last decades, but has been rarely exploited for light-emitting device applications. One critical reason is that the ECL is typically achieved in liquid, which is not the best phase for electronics. The other reason is that it involves relatively slow diffusion process of electrochemical species in electrolyte, which makes the response of the resulting light-emitting devices to be very slow. Clever ways to circumvent these issues will be discussed. Solid-state integrity of the electronic devices can be attained by gelating the electrolyte using matrix polymers, which we referred to as the ECL gel. The slow device response can be overcome by applying AC-bias rather than DC-bias onto the device that allows generation of the reduced and oxidized species at the same electrodes and thus yields prompt light emission. The operation mechanism of these devices will be explained, and it will be compared to the operation of the light-emitting electrochemical cells, which is another type of light emitting device involving ionic processes that works in a completely different fashion. At the end, further opportunities of the new light-emitting devices based on ECL will be discussed. For example, the recent results unique ECL device design that can yield luminescence with spatially resolved pressure-sensitivity will be introduced.

Biosketch: Prof. Moon Sung Kang is an assistant professor in the Department of Chemical Engineering at Soongsil University, Korea. He received the B.S. degree in Chemical and Biological Engineering from Seoul National University in 2006 and the Ph.D. degree in Chemical Engineering from the University of Minnesota in 2011. He joined the faculty of Soongsil University in 2012, and, currently, he is a visiting scholar at the Lipomi group in the Department of NanoEngineering at UCSD. Since 2012, his group has published >50 research articles on the synthesis and characterization of electronic/ionic materials for transistors and light-emitting devices applications.