

Nanoscale Solid-State Devices for Physiological Interfaces

Shadi A. Dayeh

Integrated Electronics and Biointerfaces Laboratory

Department of Electrical and Computer Engineering

University of California San Diego

sdayeh@ucsd.edu

The development of nanotechnologies that can provide high spatiotemporal resolution in monitoring electrophysiological activity can enable newer frontiers of scientific discovery in bio-nanoelectronic interfaces and can provide continuous, timely, and predictive information about our health without visiting the hospital except when specialized therapy is needed. This talk will focus on the development of electronic materials for neuronal interfaces and solar powered wearable technologies. We developed a robust and scalable fabrication process for ultra-high density intracellular neuronal probes on insulating and flexible substrates. Arrays at an electrode density of 10 million/cm² enabled multiple intracellular and extracellular single-unit recordings with ~2000X signal-to-noise ratio paving the way for mapping minute potential changes in single cells and at synapses in networks of neurons. On a relatively larger scale, a single-step junction formation for thin (<10µm) Si solar cells and Si CMOS devices has been achieved with 13% power conversion efficiency. The integration of these compact size, flexible, and conformal solar-powered electronics for wearable technologies on flexible substrates is underway to push the boundaries for wearable electronic devices.



Biography: Shadi Dayeh received his PhD degree in Electrical Engineering from the University of California San Diego in 2008 and joined Los Alamos National Laboratory as a Director fellow. He was promoted in 2010 to a Distinguished Oppenheimer fellow where he co-led with S.T. Picraux the nanowire program at Los Alamos. In Nov. 2012, he joined the ECE department at UCSD as an Assistant Professor and his group pursues fundamental and applied electronic materials research for a variety of applications. He is the recipient of Electronics Materials Conference outstanding oral presentation (2006), the Material Research Society graduate student award and best poster award (2007), PCSI young scientist award (2007), the 1st place in Advanced Technology Workshop paper competition (2008), a LANL Distinguished Postdoctoral Performance Award (2010), LANL Achievement Awards (2009, 2010, 2011) and an NSF Early CAREER Award (2014).