Graduate Seminar (EEL 6936)
Department of Electrical Engineering
http://ee.eng.usf.edu/Grad_Seminar

Dr. Stephen E. Saddow

University of South Florida, Tampa, FL, USA
Electrical Engineering Department

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CUTR Building, CUTR 202

Silicon Carbide Technology Development at USF

Abstract

Silicon carbide continues to make tremendous inroads into the power electronics market, with projections of ever expanding market share in the next decade. In fact a recent marketing survey reports that the silicon carbide semiconductor market is estimated to grow $3182.89 Million by 2020, at an estimated CAGR of 42.03% from 2014 to 2020. With this in mind the extensive experience of the USF SiC Group, led by Prof. Saddow, is well poised to contribute at several levels – basic research on materials growth and processing as well as device prototyping. This seminar will be presented in three parts in order to answer the following key questions:

1. Why SiC?
2. SiC capabilities present at the University of South Florida
3. What the USF SiC group has contributed to the field of SiC Biotechnology

Since its inception in the 1970's, brain-machine-interfaces (BMIs) have held the promise of providing an engineered pathway to restore central and peripheral system function when trauma or disease disrupt signals from the brain to other parts of the body. While impressive demonstrations of this technology have been made over subsequent decades, the lack of a biocompatible semiconductor has prevented BMIs from reaching their full potential. While silicon powers most of the electronics that we use in our everyday life, unfortunately it is not biocompatible and efforts to 'fool the body' by applying biocompatible coatings have all failed in vivo. At the University of South Florida a team of electrical engineers and neuroscientists have been developing silicon carbide (SiC) semiconductor devices for use in BMIs. Our group has proven that SiC is indeed biocompatible by showing outstanding in vivo performance in wild type mouse brains. This seminar will discuss both the state of the art of SiC biotechnology as well as review other biomedical devices such as heart stent coatings, bone prosthetic coatings and in vivo sensors.

Biography

Dr. Stephen E. Saddow is a Professor in Electrical Engineering Department at University of South Florida, Tampa. He received a B.E. in Electrical Engineering from the Western New England College, an M.S. in Electrical Engineering from Polytechnic University, and a Ph.D. in Electrophysics (EE) from University of Maryland at College Park. His research interests are to develop wide-bandgap semiconductor materials for biomedical applications MEMS/NEMS applications. . His group has demonstrated the in-vitro biocompatibility of 3C-SiC to numerous cell lines and lately his research has focused on the central nervous system. His ultimate research objective is to develop smart sensors for harsh environments and biomedical applications based on wide band gap semiconductor materials Presently he has pioneered the use of SiC for biomedical applications, having demonstrated that 3C-SiC is both bio- and hemo-compatible. His group has demonstrated several advanced biomedical devices, from microelectrode arrays (MEAs) to neural probes, in-vivo glucose sensors and impedance-based biosensors and optically tunable RF structures. He recently edited a book on SiC entitled "Silicon Carbide Biotechnology: A Biocompatible Semiconductor for Advanced Biomedical Devices and Applications".