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SEMINAIRE

(de 13 h à 14 h, salle Belledonne, IMEP-LaHC, Bât. BCAi, Minatec, ouvert à tous : enseignants, étudiants, chercheurs, administratifs, techniciens)

Jeudi 1er juin 2017

"Silicon Carbide Biotechnology"

by Prof. Stephen E. SADDOW
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Abstract: Silicon carbide (SiC) is a semiconductor that displays ceramic-like properties. Long known for its hardness and resistance to chemical attack, research into developing SiC electronics has been an active topic since the 1950's. Numerous reports of SiC as a potential material for interfacing with the human body have been around for decades, but only recently has a comprehensive look into SiC for biomedical devices been undertaken. Starting in 2005 the USF SiC Group started to study the biocompatibility of various SiC single-crystalline forms, known as polytypes, and our research was aimed at both understanding the potential of SiC for biomedical applications and to understand why discrepancies in the literature existed: some reports stating that SiC was cytotoxic and other biocompatible. We have since this time studied various forms of SiC, mainly 3C-, 4H-, 6H- and amorphous SiC to various biological systems as skin and connective tissue, blood platelets, neurons, etc. We have also compared the in-vivo response of tissue (wild type mice) to 3C-SiC and Si and have found a very promising null response for 3C-SiC, at least for 30 days in-vivo. Additional work has shown similar results for a-SiC coated probes thus motivating the development of implantable biomedical devices using SiC as the requisite materials. At the University of South Florida a team of electrical engineers and neuroscientists have been developing silicon carbide (SiC) semiconductor devices for use as implantable neural interfaces (INIs). This lecture 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, in vivo sensors, etc.

***Dr. Saddow's** 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. His main expertise was in the development of a hot-wall CVD growth capability specializing in the growth of SiC epitaxial films on Si substrates. He edited a book on SiC electronic materials/devices with one of the power electronics pioneers at Cree, Inc. S. E. Saddow and A. Agrawal, Editors Advances in Silicon Carbide Processing and Applications, © 2004 Artech House ISBN 1-58053-740-5. He is a senior member of the IEEE and has over 100 publications on SiC materials and devices, with nearly half in archived journals.*

Presently he has pioneered the use of SiC for biomedical applications, having demonstrated that 3C-SiC, which is the cubic form that can be grown heteroepitaxially on Si substrates, 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 second book on SiC entitled Silicon Carbide Biotechnology: A Biocompatible Semiconductor for Advanced Biomedical Devices and Applications, Second Edition, © 2015. For more information on Dr. Saddow's research activities visit his homepage at http://www.eng.usf.edu/~saddow

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