

Micro and Stretchable Electrodes: Fundamental and Applied Aspects in Neuron Analysis

微型柔性电极的基本原理及其在神经分析中的应用

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**14:30 – 15:30, June 23, 2014
1668 Room**



Abstract:

Bioelectronics is the discipline resulting from the convergence of biology and electronics and it has the potential to significantly impact many areas especially in healthcare and medicine, homeland security, forensics, and protecting the environment and the food supply. Not only can advances in electronics impact biology. Among this, the development of the neuron microelectrodes (i.e., recording and stimulating the electrical activity of neuron) approximately 40 years ago was one of the defining moments that helped establishing the field of neuron chemistry, electrophysiology, and is now an integral part of clinical practice. However, due to the technical limitations, such as inducing neuron damage, low throughput, etc., of the existing carbon or other metal-based microelectrodes, more reliable and efficient analytical tools are required for mapping the structure and functions of a complicated brain neuron system.

Stretchable electronics concerns electrical and electronic circuits and combinations of these that are elastically or inelastically stretchable by more than a few percent while retaining function, which is a rapidly emerging interdisciplinary technology fields involving chemists, physicists, material scientists, engineers and biologists. This lecture will outline the recent research activities for the development of functional micro and stretchable electrodes and their current and potential applications in medical analysis especially in neuron analysis. Several type of electrodes, including SECM/SICM microelectrodes, CMOS based micro electrode arrays, and PDMS based stretchable electrodes, developed at Tohoku University (Japan) and Florida International University (FIU), will be introduced.

Biography:

Prof. Chenzhong Li earned his M.Sc in electrochemistry and PhD in bioengineering from Kumamoto University (Japan) in 1996 and 2000. Before joining FIU in 2006, he held a position as a Research Officer at the Nanobiotechnology lab in the Canada National Research Council (Montreal). Currently he is a tenured associate professor in the Department of Biomedical Engineering at Florida International University, and JSPS professor in the WPI-Advanced Institute for Materials Research, Tohoku University. Dr Li's research has focused primarily on the clinical point-of-care, biodefense and environment related applications of bioelectronic sensing technology.

His research activities to date have resulted in 7 granted patents, approximately 90 peer-reviewed journal papers with H-index 25 by 2013, 2 books and 4 book chapters, over 140 oral presentations including about 90 keynote/invited lectures and seminars worldwide. In addition to his publication activities, he is the guest editors of American Journal of Biomedical Science, and the Journal of Neuroscience and Neuroengineering. He is the associate editor of the journals of Applied Biochemistry and Biotechnology, Chemical Sensors, and Biosensors Journal. He is an academic editor of PLoS ONE. He also serves on several journal editorial boards as well as being a reviewer and panelist for NIH, NSF, NSERC (Canada), NSFS (China), NES (UK) and Chinese 973 program. In recognition of his work, Dr. Li has received several awards and honors including the FIU faculty research award (2008), the Kauffman Professor Award in 2009 and 2011, 2013 FIU CEC Outstanding Faculty Award in Research and 2013 Japanese JSPS visiting professor fellowship.