The 47th JUACEP Seminar

第 47 回 名古屋大学日米加協働教育プログラムセミナー

Date: 13:30-15:00　August 20 (Mon), 2018

Venue: Idea Stoa, NIC 1st floor

From Crystal Growths to Renewable Energy: The Importance of Eliminating Dislocations from Wide-bandgap Power Switching Transistors

Prof. Ya-Hong Xie

Bio-plasmonics Interaction Research Laboratory
Dept. Materials Science and Engineering
University of California, Los Angeles

Summary

Crystalline structure represents thermodynamically stable configuration of all solid-state materials. Among them, semiconductor crystals represent a unique family of material of which all transistors are made. It serves as the bedrock of the information network that has become an inseparable part of our daily lives. Modern transistors are often built into thin films of semiconductor epitaxially grown over substrates of different materials. Lattice mismatch leads to crystalline defects noticeably dislocations which in turn impact negatively on transistor performance. The challenge is especially severe in the family of semiconductors known as wide bandgap semiconductors uniquely suited for power switching applications (the technology backbone of power grids, and hybrid and electric vehicles).
In this talk, I will present a review of the knowledge background regarding to dislocation dynamics in semiconductors heterostructures, their electrical activities, and the ways they could potentially impact transistor performance. Emphasis will be placed on dislocations in group-III nitrides (GaN, InN, AlN, and alloys of them). Some of the approaches aimed at reducing the impact of dislocation to group-III nitride device performance will be discussed. One such approach developed by my group at UCLA and employed in a Nagoya University-UCLA collaborative research will be presented together with some of the recent experimental results. (Talked in English)

Lecturer: Ya-Hong Xie obtained the B.Sc. degree in physics from Purdue University, West Lafayette, Indiana, US, in 1981, and the M.Sc. and Ph.D. degrees in electrical engineering from UCLA.
He was a member of the technical staff in the Physical Sciences and Engineering Research Division, Bell Laboratories from 1986 till 1999. In 1999, he joined the faculty of UCLA as a Professor in the Department of Materials Science and Engineering. He has authored and coauthored over 180 technical articles and is the holder of 40 US patents as well as a number of patents of other countries including Korea, Japan and China. His research interests include epitaxial growths of semiconductor materials, Si-based material and device physics, Si integrated circuit technology, van der Waals materials, and bio-sensing. His current research focus is in bio-sensing using plasmonics enabled technologies and also on group III nitride materials epitaxy and devices.
He is a fellow of IEEE. He is the winner of 2012 Research Award of Alexander von Humboldt Foundation. He has been a visiting scientist of IHP, the Leibniz Association Germany Institut für Innovative Mikroelektronik since 2010. He holds and held guest professor positions of Peking University (China), Xi'an Jiao Tong University (China), National Cheng Kung University (Taiwan), and Nanjing University (China). He is Guang Biao Chair Professor at Zhejiang University.

Inquiry: JUACEP Office (phone 789-2799)

Presented by JUACEP: Japan-US-Canada Advanced Collaborative Education Program, Graduate School of Engineering