

“BNC Seminar”

Friday, August 19th, 2016 @ 3:00pm

BRK, ROOM 2001

Zhe Chuan Feng

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Title: Interdisciplinary Studies on Wide Gap Semiconductors, Nano-Materials and Devices

Bio: Prof. Zhe Chuan FENG, received B.S. & M.S. (1968,1981, Peking University), Ph. D in University of Pittsburgh, 1987; worked at Emory University (1988-92), National University of Singapore (92-94), Georgia Tech (95, 2002-03), EMCORE Corporation (95-97), Institute of Materials Research & Engineering, Singapore (98-2001), Axcel Photonics (2001-02), and National Taiwan University (2013-2015.1, retired with honor). Since 2015.3, Feng joins Guangxi University (GXU) as a Distinguished Professor at Physics College, established and leads Laboratory of optoelectronic materials & detection technology.

He has published 9-review books on semiconductors and nano-engineering (2-new books under editing), >600 scientific papers with >220 recorded by Science Citation Index (SCI) and cited >3600 times. Feng had been a member of international organizing committee of Asia CVD, organizing committee of international conference for white LEDs and solid state lightings, and Board of Directors, Taiwan Association for Coating and Thin Film Technology (TACT), Guest professors at Nankai University, Tianjin Normal University, Huazhong University of Science & Technology, South China Normal University, Nanjing Tech University, Sichuan University. He has been awarded as the SPIE Fellow (2013).

Abstract: Research and developments on advanced semiconductors, especially wide energy gap GaN, SiC and ZnO based, various oxides, related materials and quantum/nanostructures are very active in recent years. Energy-efficient and environmentally friendly solid-state light sources, in particular GaN-based light emitting diodes (LEDs), and solar cells, are currently revolutionizing a vast number of applications [1]. The achievements on GaN-based blue LEDs are just awarded for 2014 Nobel-Physics prize. It is expected that LEDs may replace the traditional light bulbs and tubes to achieve a new lighting era. Solar cells may increase their share in energy production. SiC is recognizing as power electronic materials for 21st century, with enhanced R&D over the world [2]. ZnO is rising as the 3rd class of promising wide gap semiconductor [3]. New oxides & compound semiconductors are developing amazingly.

This presentation reports on our recent selective works in high SCI-J, including international collaboration, via multi-techniques of HR-XRD, HR-TEM, photoluminescence (PL), PL excitation, time resolved (TR) PL, Raman scattering, FTIR, spectroscopy ellipsometry (SE), X-ray photoelectron spectroscopy (XPS), Rutherford backscattering (RBS), Synchrotron radiation X-ray absorption (XAS), on following issues:

1) III-Nitride (GaN, AlN, InN, AlGaIn, InGaIn, AlInGaIn) materials & quantum well/nano-structural LEDs/LDs/QDs. Mysteries of unveiled physical origin of intense light generation from N-LEDs/LDs/QDs are explored. 2) Interdisciplinary and cross science-field studies on SiC materials using Raman & resonant Raman scattering, SE, FTIR, PL plus RBS, SR-XAS & XPS, for 3C-SiC/Si, 3C/4H-SiC, 6H/6H-SiC & 4H/4H-SiC. 3) Multi-technique investigation on MOCVD/PLD-grown ZnO, MgZnO, AlZnO, and InGaIn/GaN/ZnO. 4) Other & related: high-k HfTaO₂; Ga₂O₃, Solar cells (CdTe/CdS-, ...); III-V & II-VI compounds.

The combination of theory-experiments, and interdisciplinary research are demonstrated. Some unsolved and challenging research issues are presented. It's hopeful to penetrate into fundamental concepts and properties, to promote research in related fields, and to develop the collaboration & exchanging, for students and professors.

[1] Zhe Chuan Feng ed., *III-Nitride Devices and Nanoengineering* (2008), *III-Nitride Semiconductor Materials* (2006), Imperial College Press, London. (Two new books on III-Nitrides and LEDs to publish in late 2016)

[2] Zhe Chuan Feng ed., *SiC Power Materials—Devices and Applications*, Springer, Berlin, 2004.

[3] Zhe Chuan Feng ed., *Handbook of Zinc Oxides and Related Materials: Vol.1 Materials, Vol.2 Devices and Nano-Engineering*, CRC, Taylor & Francis, London/New York, 2012.