

# Optoelectronics Materials and Nano/Quantum Structures

Research and developments on advanced semiconductors, especially wide energy gap GaN, SiC and ZnO based, various oxides, related materials and quantum/nano structures 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 an increasing number of applications, and bring apparent benefits to vast areas of development, such as lighting, communications, biotechnology, imaging, energy conversion, photovoltaic, and medicine. It is expected that LEDs may replace the traditional light bulbs and tubes to achieve a new lighting era. Solar cells may gradually increase their share in energy production. SiC is recognized as the power electronic materials for the 21st century. ZnO is rapidly rising as the 3rd class of promising wide gap semiconductor. New oxides & compound semiconductors are developing amazingly, incorporated into above energy-saving devices. This presentation reports on our physics and material science studies on these materials and structures. It emphasizes on interdisciplinary studies via multi-techniques of high-resolution X-ray diffraction (HRXRD), high-resolution transmission electron microscopy (HRTEM), Raman scattering (RS), photoluminescence (PL), photoluminescence excitation (PLE), time resolved (TR) PL, Fourier transform infrared (FTIR), X-ray photoelectron spectroscopy (XPS), secondary ion mass spectroscopy (SIMS), Rutherford backscattering (RBS) and ion channeling, Synchrotron radiation (SR) XRD, X-ray absorption (XAS) and their combinations. Works and contributions in these fields from the author, students and collaborators in recent years, especially in 2011-2012 are introduced. Some challenging/unsolved scientific issues are raised.

Prof. Zhe Chuan FENG, received the BS (1968) and M.S. (1981) from Peking University, and Ph. D in University of Pittsburgh, 1987. He had 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), and Axcel Photonics (2001-02), in all places with fruitful results and achievements. Since August 2003, Feng has joined National Taiwan University as a professor at Institute of Photonics and Optoelectronics & Department of Electrical Engineering, currently focusing on materials investigation and MOCVD growth of wide gap semiconductors of III-Nitrides, ZnO and SiC, as well as III-V, II-VI, oxides and other nano-materials/devices. He has published nine review books on advanced compound semiconductors and microstructures, porous Si, SiC, III-Nitrides, ZnO. Feng has published ~500 scientific/technical papers with ~190 selected by Science Citation Index (SCI) and cited > 2300 times. Feng is a member of international organizing committee of Asia CVD, : / , Guest professors at Nankai University, Tianjin Normal Univ., Huazhong Univ. of Sci. & Tech., South China Normal University.

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