



Seminar Announcement

Department of Physics; Department of Electro-Optics and Photonics

Date: Monday, September 11, 2017

Time: 1:30 - 2:30 pm

Location: Science Center Auditorium (SC 114)

(Snacks will be provided)

Title: Non-conventional light absorption and emission from Si and Ge materials in the infrared region

Dr. Jim Williams

Research School of Physics and Engineering,

Australian National University, Canberra, Australia.

Abstract

Normally Si does not absorb infrared light, but if this was possible it would open up opportunities for more efficient Si-based solar cells and high resolution infrared photodetector arrays. In addition, Ge is an indirect semiconductor and hence has low efficiency for light emission; however, if the band structure of Ge can be suitably modified there are possibilities for light emission and even for fabricating lasers operating in the infrared. Neither of these challenges is straightforward and requires non-conventional and non-equilibrium approaches. After giving the relevant background on the conventional electronic structure and optical properties of Si and Ge, this presentation gives examples in both materials that demonstrate substantial progress towards achieving desirable non-conventional photonic properties. In both cases we have used a combination of high dose ion implantation and ultra-rapid pulsed laser melting (PLM) processing methods. A range of characterization techniques are also introduced that we have used to analyze the novel properties of resulting Si and Ge-based materials, including Rutherford backscattering and channeling (RBS), Raman spectroscopy, scanning and transmission electron microscopy (SEM and TEM), x-ray diffraction (XRD) and mapping, photoluminescence (PL), as well as optical absorption measurements.

Bio

Williams obtained his BSc (1969) and PhD (1973) degrees from the University of New South Wales. He was the recipient of the Boas Medal of the Australian Institute of Physics (1993) and the Thomas Rankin Lyle Medal of the Australian Academy of Science (2011). He is a Fellow of the Australian Academy of Science, the Australian Academy of Technological Sciences and Engineering, the Materials Research Society, American Physical Society, and is Past President of the Australian Materials Research Society. He has published over 480 refereed papers and five books in a broad spectrum of sub-fields within semiconductors, materials science and processing, device fabrication and engineering.