Queensland Micro- and Nanotechnology Centre

SEMINAR

Speaker: Professor Chris F. McConville
Deputy PVC for Research and Innovation
RMIT University
Melbourne

Date: Friday 9 November 2018

Time: 11.00 am

Venue: N76 Seminar Room 1.01, Campus Heart, Nathan Campus

Title: **Electron Pile-Up at Semiconducting Surfaces**

Abstract

The phenomenon of “electron pile-up” or more correctly, electron accumulation has been observed and identified at the surfaces of numerous semiconducting materials, including ZnO and InAs, and is in marked contrast to the electron depletion typically observed at the surfaces of conventional III-V, II-VI and Group IV semiconductor materials. However, with the advent of high-quality epitaxially grown materials, a more general model of surface electron accumulation has been developed – particularly with the discovery of this phenomenon at the surface of the Group-III nitride material, indium nitride (InN). More recently still, surface electron accumulation has been observed at the surfaces of a particular sub-set of epitaxial oxide semiconductor materials, that display both optical transparency and a high degree of electrical conductivity, the so-called transparent conducting oxides (TCOs). The fact that these oxide materials have been used industrially for many years, as transparent conductors in a relatively low-quality form, has perhaps contributed to the belated recognition of using them materials as semiconductors in their own right. In this presentation examples from the surface and bulk electronic properties of InN, In-rich InGaN, and several epitaxially grown oxide semiconductors, including In_2O_3, CdO and ZnO, will be discussed along with the effects of modifying their surfaces by controlled adsorption. The valence band density of states and the surface electronic properties of these materials have been studied using high-resolution synchrotron radiation angle-resolved photoemission (SR-ARPES) and core-level photo-emission spectroscopy with hard x-rays (HAXPES), and these data are compared with theoretical DFT band structure calculations. The physical origins of this phenomenon and the quantized nature of the subsequent surface 2D electron gas, will be discussed in terms of the band structure and intrinsic properties of these materials.

For enquiries, please contact Mrs Lacey Shaw: l.shaw@griffith.edu.au

ALL WELCOME
