MACQUARIE University

MQ Photonics Research Centre seminars

Speaker: Dr Noushin Nasiri

Time: Tuesday 8 September at 2 PM

Location: MPR & via Zoom

Title: Ultraporous Nanoparticle Networks for High Performance Nanosensors and Photodetectors

Abstract: Accurate measurement of ultraviolet radiation is key to many technologies including wearable devices for skin cancer prevention, optical communication systems, and missile launch detection. Nanostructuring of wide bandgap semiconductors, such as GaN, ZnO, and SiC, promises some benefits over established commercial solutions relying on n–p type Si-homojunction technology. In the past decade, a variety of carefully nanostructured architectures have been demonstrated as efficient designs for visible-blind UV photodetectors featuring superior detectivity, thermal stability, robust radiation hardness, and very low operation bias and power consumption. In this talk, we present an ultraporous nanostructured metal-oxide sensor with an average film porosity of 98% that results in excellent selectivity, record high milliampere photocurrents to very low ultraviolet light intensities and nanoampere dark currents, resulting in the highest (9.3 × 106) photo- to dark-current ratio so far reported. This excellent performance is attributed to the high film porosity (98%) and electron-depleted composition of these nanoparticle networks. This concept can be applied to other highly performing semiconductors such as SnO2 and can provide a robust set of guiding principles for the engineering of portable nanoparticle-based gas and light sensors.