Biosensors: The Benefits of Nanotechnology

Prof J. Justin Gooding

School of Chemistry, The University of New South Wales, Sydney, 2052, Australia

Nanotechnology is having a profound effect on the development of new biosensors. Biosensors commonly comprise a biological recognition molecule immobilised onto the surface of a signal transducer to give a solid state analytical device. The reaction between the biorecognition molecule and the analyte is a heterogeneous reaction and therefore the design of the biosensing interface is all important in determining the final performance of the biosensor. Advances in nanofabrication of biosensing interfaces is one of the two major areas where nanotechology has dramatically impacted on biosensor research in the last few years. With regards to fabricating biosensing interfaces the rise of self-assembled monolayers (SAMs) has been particularly important in giving molecular level control over the fabrication of the biosensing interface. Using SAMs has resulted in not only better performing biosensors but also new opportunities in developing new types of transduction mechanisms in biosensors which are more sensitive, selective or both. The application of new nanomaterials, be they nanoparticles, nanotubes or nanoporous materials, to biosensing is the other major area in which nanotechnology has influenced biosensing research. The use of high surface area nanomaterials has been important in producing biosensors with greater sensitivity and shorter responses times as well as being compatible with *in vivo* biosensing. This presentation will discuss the importance of nanotechnology on biosensing research drawing from examples in our laboratory. In the first half of the presentation we will concentrate on the advantages of fabricating biosensing interfaces using self-assembled monolayers. The latter half of the presentation will discuss some of the unique opportunities nanomaterials provide for biosensor development.

Biography

Scientia Professor Justin Gooding graduated with a B.Sc. (Hons) from Melbourne University before spending two years working for ICI Research. He then returned to University obtaining a D.Phil. from the University of Oxford and received post-doctoral training at the Institute of Biotechnology in Cambridge University. He returned to Australia in 1997 as a Vice-Chancellor's Post-Doctoral Research Fellow at the University of New South Wales (UNSW) before commencing a lectureship at Flinders University in 1998 and then UNSW in 1999. He was promoted to full professor in 2006 and in 2011 he was promoted to Scientia Professor, the highest award for research performance given by UNSW. He was one of the recipients of a 2004 NSW Young Tall Poppy award, a 2005 Alexander von Humboldt Fellowship, the 2007 RACI Lloyd Smythe Medal for Analytical Chemistry and the 2009 Eureka Prize for Scientific Research. He is currently and ARC Professorial Fellow in the School of Chemistry at UNSW where he leads a research team of 23 people interested in surface modification and nanotechnology for biosensors, biomaterials, electron transfer and medical applications.