Scientia Professor J. Justin Gooding

Biography: Scientia Professor Justin Gooding is currently an ARC Australian Laureate Fellow, the co-director of the Australian Centre for NanoMedicine and the co-director of the New South Wales Smart Sensing Network. He is a Fellow of the Australian Academy of Science and the Australian Academy of Technology and Engineering. He is the inaugural editor-in-chief of the journal *ACS Sensors*.

He leads a research team of over 40 researchers interested in surface modification and nanotechnology for biosensors for medical applications, electrocatalysis and 3D cell printing.

Nanoparticles that mimic the three-dimensional architecture of enzymes: The role of nanoconfinement in enhancing electrocatalytic reactions

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Abstract: Nanoparticle electrocatalysts and enzymes present common features such as their size and the reactions they catalyze. One main difference between them is that while the active sites of nanoparticles are in direct contact with the electrolyte, enzymes have their catalytic sites spatially separated from the solution environment, providing high reaction kinetics and selectivity. In this work enzyme architecture is used as inspiration to make nanozyme[1]; nanoparticles containing isolated channels and with the outside surface electrochemically passivated to enable the electrochemical reaction to happen exclusively inside those channels. This was first shown with PtNi nanoparticles for the oxygen reduction reaction (ORR) where it is shown that the excellent electrocatalytic performance is due to nanoconfinement effects[2]. Subsequently we show how nanozymes can be developed for performing cascade reactions using the carbon dioxide reduction reaction as the model reaction where nanoparticles with a silver core and a copper shell are designed. Here we show how the nanoconfinement influences the product distribution[3].

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