14th World Bioenergy Congress and Expo

June 06-07, 2019 | London, UK

E. coli synthesized platinum and palladium nanoparticles as polymer electrolyte membrane fuel cell (PEMFC) catalysts

Alan J Stephen[1], **Neil V Rees**[1], **Iryna P Mikheenko**[1], **Surbhi Sharma**[1], **Lynne E Macaskie**[1] and **Mohamed L Merroun**[2]
[1]University of Birmingham, UK
[2]University of Granada, Spain

Biosynthesis of nanoparticles (NP) is emerging as a new, eco-friendly and high yield alternative to chemical NP synthesis. Various microbial strains (including E. coli) have been used to synthesize bio-nanoparticles (BioNPs) from a variety of elements including precious metals such as platinum, palladium and gold. Pt and Pd nanoparticles have been extensively investigated as electrocatalysts in Polymer Electrolyte Membrane Fuel Cells (PEMFC) and such BioNPs could work effectively as electro-catalysts for PEMFC. However, all these processes require highly destructive methods for NP extraction before they use as a catalyst, e.g., E. coli-Pt catalyst was comparable to commercial counterparts, but chemical NP extraction was slow (~1 month) which destroyed the bio-scaffold and increased particle sizes. The problematic inherent resistivity of native *E. coli* biomass was overcome by use of *E. coli* -Pd NPs which formed primarily on the cell surface to act as a conductive shell, but substitution of Pd for Pt compromised the power output. A sequential synthesis of palladium and then platinum on *E. coli* made a bimetallic E. coli-Pt/Pd catalyst with activities higher than its single metal counterparts. A suite of catalysts with a range of metal loadings was made and the materials were characterised using high resolution STEM with energy dispersive X-ray microanalysis (EDX) mapping, and XRD and XPS analyses, alongside tests ex-situ in a three electrode cell to evaluate their catalytic activities and durabilities as compared to commercial catalysts.

Biography

Alan J Stephen is a PhD student at the University of Birmingham with the CDT in Fuel cells and their Fuels. His work focuses on utilising bacteria to synthesize precious metal nanoparticles to use as catalysts in a fuel cell.

AJS578@bham.ac.uk

Notes: