Pt@Ni core-shell nanoparticles as catalyst for the oxygen reduction reaction

In the search for an alternative towards fossil fuels to form the future portable energy source, proton exchange membrane fuel cells (PEMFCs) are considered to be a promising candidate. However, the sluggish kinetics of the oxygen reduction reaction (ORR) necessitate the use of a cathodic catalyst, typically made from platinum, which increases the production costs significantly. Additionally, the current Pt catalysts have neither the activity, nor the stability required to make PEMFCs economically viable. Therefore, the current research towards ORR catalysts focusses on bimetallic nanoparticles, combining the individual properties of different metals in one particle [1, 2]. Indeed the interplay of electronic and lattice effects in bimetallic core-shell NPs has been proven to significantly enhance the catalytic performance [3]. Here, we present Pt@Ni core-shell nanoparticles as catalyst for the ORR, synthesised via electrodeposition and subsequent galvanic displacement. The nanoparticles were characterised using high angle annular dark field scanning transmission electron microscopy (HAADF-STEM) and STEM energy dispersive X-ray spectroscopy (STEM-EDS) and the catalyst performance was further analysed using cyclic and linear sweep voltammetry.

References

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