

The Effect of Reducing Agents on the Electronic, Magnetic and Electrocatalytic Properties of Thiol-Capped Pt/Co and Pt/Ni Nanoparticles

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Abstract

The electronic, magnetic and electrocatalytic properties of bimetallic thiol-capped Pt/Co and Pt/Ni nanoparticles were synthesised using two reducing agents, NaBH_4 and N_2H_4 . X-ray diffraction analysis of the nanoparticles showed Pt lattice contraction upon the addition of Co or Ni to Pt indicating the formation of an alloy structure, more apparent when N_2H_4 was used. XPS data analysis revealed Pt metal and Pt(II) (assigned to PtO) and a higher concentration of surface metallic Ni and Co for the NaBH_4 -reduced samples. Both the NaBH_4 - and N_2H_4 -reduced catalysts were active for the methanol oxidation reaction (MOR), with the Pt-Co- N_2H_4 catalyst revealing the highest activity. The N_2H_4 significantly affected the magnetic properties of Pt/Co and Pt/Ni particles by controlling the morphology and crystalline structure of the nanoparticles. In general, the type of reducing agent affected the final properties of the nanoparticles.