Abstract

In this study, we propose Pd nanocube (PdNCs) supported by modified graphene hybrid materials as nano-catalysts for an enhanced electrooxidation of formic acid. The homogeneous and high dispersed cubic shaped Pd nanoparticles **(**11 nm**)** supported on p**-**amino aniline functionalized graphene (PdNCs/GPAA**)** were successfully prepared by one pot method incorporated with the use of ascobic acid **(**AA**)** as reducing agent and KBr**/**NaCl in an absence of any surfactants**.** These materials were confirmed and characterized by AFM, Raman, FTIR, XPS, XRD, and TEM techniques**.** The obtained PdNCs on functionalized graphene (PdNCs/GPAA**)** electrocatalysts were performed in the electrooxidation of formic acid solution using cyclic voltammetry. The results show that PdNCs/GPAA display a remarkable mass activity (495 $mAmg^{-1}$, over 20 times compared to an PdNCs on unmodified graphene (PdNCs/rG), and over 4 times compared to PdNPs on functionalized graphene (PdNPs/GPAA) and stability towards formic acid oxidation. Our catalyst (PdNCs/GPAA) shows about 100 times higher activity than commercial catalyst of Pd/C. It could be attributed to the high activity and stability of the synergistic effect of shape and modified support. This can suggest that the domainated cubic shape and functional moieties on graphene support play an important role in which does not only serve as a nucleation site for PdNPs but also induce an electron promotion of graphene to metal, leading to higher activity and CO tolerance.

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Project Title : Ag-Pd core-shell nanocatalyst supported onto functionalized graphene sheet and their superior electrocatalytic activity

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Project Period : 2years

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Keywords : Pd nanoparticles, functionalized graphene, formic acid oxidation

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