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Caffeine-assisted facile synthesis of platinum@palladium core-shell nanoparticles supported on reduced graphene oxide with enhanced electrocatalytic activity for methanol oxidation

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Abstract

A facile, rapid, and wet-chemical co-reduction method is developed for synthesis of platinum@palladium core-shell nanoparticles supported on reduced graphene oxide (denoted as Pt@Pd/RGO) with the assistance of caffeine, without any seed or template. Caffeine is used here as a structure-directing agent and a capping agent, which is critical to the formation of Pt@Pd core-shell nanoparticles. Furthermore, the as-synthesized Pt@Pd/RGO shows the enlarged electrochemically active surface area, remarkably enhanced catalytic activity and improved stability for methanol oxidation reaction (MOR), compared to Pt/RGO, Pd/RGO, commercial Pt black and Pd black catalysts.

Keywords: Reduced graphene oxide; core-shell nanoparticles; Electrocatalysis; Methanol oxidation reaction

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