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Atomic platinum layer coated titanium copper nitride supported on carbon nanotubes for the methanol oxidation reaction

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ABSTRACT:

In this study, a novel low-Pt core-shell catalyst is successfully prepared by depositing ultrathin Pt layer on the carbon nanotubes supported titanium nitride nanoparticles (TiN@Pt/CNTs) via a facile pulse electrochemical deposition approach. The catalyst is characterized by X-ray diffraction (XRD), transmission electron microscopy (TEM), High-angle annular dark field (HAADF) and energy-dispersive spectrometer (EDS) elemental mapping, X-ray photoelectron spectroscopy (XPS) and electrochemical measurements. The results confirm the core-shell structure of the prepared TiN@Pt/CNTs catalyst. More importantly, the catalyst exhibits superb mass activity and durability for the methanol oxidation reaction (MOR) than that of the commercial JM Pt/C catalyst. Later experiments data demonstrate that the activity and stability of the catalyst can be further enhanced via copper doping, which results from the modified electronic structure of the Pt atoms and the synergistic effects of the core-shell structure.