Synthesis of Sub-10 nm Pd-Pt Core-Shell Cubes and Octahedron, and Their Electrocatalytic Properties

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Core-shell nanocrystals with well-defined shapes could be one of the ideal catalysts for various electocatalytic reactions including oxygen reduction reaction (ORR) and formic acid oxidation reaction (FOR). This paper describes a simple, aqueous-phase route to the synthesis of Pd-Pt core-shell cubes and octahedrons by heterogeneous seeded growth of Pt shell on well-defined Pd cubes and octahedrons. All core-shell nanocrystals are less than 10 nm and the thickness of Pt shells on Pd nanocrystals are ultra-thin, less than 1 nm. We have also investigated the electrocatalytic properties of the Pd-Pt core-shell nanocrystals, demonstrating Pd-Pt core-shell octahedron bounded by {111} facets exhibited higher activity than cubes enclosed by {100} facets towards both ORR and FOR.