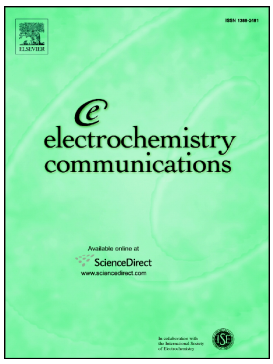

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Electrochemical transformation of platinum spheres into nanocubes and nanocubebipyramids

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Abstract

An electrochemical procedure (capping-agent free) to produce nanocrystalline platinum surfaces is developed by applying modulated AC and DC potentials to platinum wires in acid media. Platinum nanospheres grow after a DC potential has been applied for a long period, followed by hydrogen evolution reduction. The nanospheres can be further converted into nanocubes using high-frequency symmetric square wave potentials, or into cubebipyramids by subjecting the resulting spheres and cubes to cathodic hydrogen evolution at potentials between –3.0 and –0.5 V in sulfuric acid. The cubebipyramids exhibit strong catalytic activity towards carbon monoxide oxidation, which can be explained by the formation of 2(111) $\times$ (100) stepped planes.

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Keywords: platinum, nanocrystals, catalysis, cubebipyramids, square wave potentials