

Effect of Surface-Capping Agent of Pt Nanocubes for Catalytic Reaction

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Surface-capping agents affect significantly the catalytic activity and selectivity. Since those often cause difference in size or shape, and their effect on catalytic property is blurred by size or shape effect. Here, we synthesized Pt nanocubes with the same size and the same shape with (100) surfaces by using two different organic capping agents, polyvinylpyrrolidone(PVP) and tetradecyltrimethylammonium bromide(TTAB), and evaluated the effect of surface-capping agent solely for catalytic reactions. Various catalytic reactions were tested such as electrocatalytic H adsorption/desorption, ethylene hydrogenation, p-nitrophenol hydrogenation. For electrocatalytic or gas-phase reaction, the activity ratio of TTAB- to PVP-capped nanocubes showed a significant dependence on reactant molecule size due to necessity of clean Pt atom ensembles. On the other hand, the activity was similar for solution-phase reaction because the organic agents spread out in the solution minimizing the effect of alkyl chain length.