Effect of amine ligands on stabilization of pt nanoparticles as electrode materials for electro-oxidation of methanol

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Abstract

Pt-stabilized catalysts with platinum crystallites sizes between 1-20 nm were prepared using an organometallic approach and three different amino ligands; tert-butylamine, 1,3-diaminopropane and anthranilic acid. The electrochemical oxidation of methanol was investigated on Pt stabilized nanoparticles in acid solutions and the results were compared with commercial PtBlack to analyze the feasibility of applying a tailored stabilizer to improve the dispersion and electrocatalytic activity. The particle size and the degree of dispersion of the resultant nanoparticles were observed by transmission electron microscopy (TEM) and selected area electron diffraction (SAED) patterns. Dispersion differences, lattice parameters and interplanar distances were caused by the coordination of the functional groups contained in the ligands at the Pt surface. The current density peaks on methanol oxidation reaction (MOR), appearing at different potentials and are increased in the following order PtBlack ≈ Pt_{TBA}< Pt_{DAP} < PtAA. The different tendency to form aggregates and scattered particles is the result of the divergence in their sterical shapes rather than different acid-base interactions. It has been also found that stabilized Pt nanoparticles using TBA or even DAP exhibit an interesting electrocatalytic activity, and can facilitate the MOR. © J. New Mat. Electrochem. Systems.

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