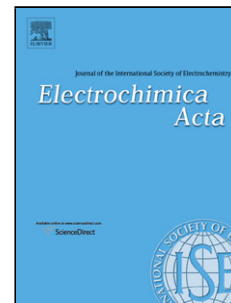


Accepted Manuscript

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PII: S0013-4686(17)31648-1
DOI: <http://dx.doi.org/doi:10.1016/j.electacta.2017.08.021>
Reference: EA 30025

To appear in: *Electrochimica Acta*

Received date: 8-5-2017
Revised date: 1-8-2017
Accepted date: 5-8-2017

Please cite this article as: Sharmin Sultana, Naoki Tachikawa, Kazuki Yoshii, Kazunobu Toshima, Luca Magagnin, Yasushi Katayama, Electrochemical Preparation of Platinum Nanoparticles from Bis(acetylacetonato)platinum(II) in Some Aprotic Amide-type Ionic Liquids, *Electrochimica Acta* <http://dx.doi.org/10.1016/j.electacta.2017.08.021>

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Electrochemical Preparation of Platinum Nanoparticles from Bis(acetylacetonato)platinum(II) in Some Aprotic Amide-type Ionic Liquids

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Abstract

Electrode reaction of bis(acetylacetonato)platinum(II), Pt(acac)₂, and preparation of Pt nanoparticles have been studied in 1-R-1-methylpyrrolidinium bis(trifluoromethylsulfonyl)amide (R = butyl, hexyl and decyl, which are abbreviated as BMPTFSA, HMPTFSA and DMPTFSA, respectively) ionic liquids by means of cyclic voltammetry and rotating disk electrode (RDE) method. Pt(acac)₂ was suggested to be reduced to Pt via a two-electron transfer process at a glassy carbon electrode. The diffusion coefficient of Pt(acac)₂ at 50°C was estimated to be $1.3 \times 10^{-7} \text{ cm}^2 \text{ s}^{-1}$ in BMPTFSA, by RDE measurements. It has been demonstrated that Pt nanoparticles were able to be prepared at the glassy carbon rotating disk electrode (GCRDE) by potentiostatic electrolysis at −1.8 and −2.5 V in the ionic liquids containing Pt(acac)₂. The prepared nanoparticles were characterized by transmission electron microscopy, energy dispersive X-ray spectroscopy and electron diffraction. No pronounced variation in the average particle sizes of Pt was observed with the rotation rates at RDE, indicating that the average particle size was independent of the rotation rate or current density. Pt nanoparticles of average sizes of 2.1 ± 0.8 , 2.8 ± 0.8 and 3.0 ± 0.8 nm were obtained after electrolysis at −1.8 V with a rotation rate of 1000 rpm in BMPTFSA, HMPTFSA and DMPTFSA, respectively, suggested that the average particle size may depend on the kind of the ionic liquid.

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