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PII: S1572-6657(18)30221-2
DOI: doi:10.1016/j.jelechem.2018.03.046
Reference: JEAC 3962

To appear in: *Journal of Electroanalytical Chemistry*

Received date: 8 January 2018
Revised date: 28 February 2018
Accepted date: 21 March 2018

Please cite this article as: Edward Kennedy, Vladimir Katovic, Suzanne Lunsford , An electrochemical investigation of the electrodeposition of non-intact tri-nuclear clusters on platinum working electrodes. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Jeac(2017), doi:10.1016/j.jelechem.2018.03.046

An Electrochemical Investigation of the Electrodeposition of Non-Intact Tri-Nuclear Clusters on Platinum Working Electrodes

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Abstract

The goal of this research was to study the electrochemical behavior of tri-nuclear clusters of molybdenum and tungsten - first in the ionic liquid $EMIBF_4$, and then in the polar-aprotic solvent DMSO. Four tri-nuclear cluster compounds were studied: Hexa-µ2-acetatotriaquadi-µ3-oxotrimolybdenum (IV, IV, IV) trifluoromethanesulfonate $[Mo_3\ O_2\ (O_2\ CCH_3\ )_6\ (H_2\ O)_3\ ](CF_3\ SO_3\ )_2$, Hexa-µ2-acetatotriaquadi-µ3-oxodimolybdenum (IV, IV) tungsten (IV) trifluoromethanesulfonate $[Mo_2\ WO_2\ (O_2\ CCH_3\ )_6\ (H_2\ O)_3\ ](CF_3\ SO_3\ )_2$, Hexa-µ2-acetatotriaquadi-µ3-oxomolybdenum (IV) ditungsten (IV, IV) trifluoromethanesulfonate $[MoW_2\ O_2\ (O_2\ CCH_3\ )_6\ (H_2\ O)_3\ ](CF_3\ SO_3\ )_2$, and Hexa-µ2-acetatotriaquadi-µ3-oxotritungsten (IV, IV, IV) trifluoromethanesulfonate $[W_3\ O_2\ (O_2\ CCH_3\ )_6\ (H_2\ O)_3\ ](CF_3\ SO_3\ )_2$. All information gathered from CV data on tri-nuclear clusters will be discussed. The study of the electrodeposition efforts with molybdenum- and tungsten-based tri-nuclear clusters onto Pt electrodes in $EMIBF_4$, and DMSO, will be compared to past investigations by Katovic et al.. In addition, the electrochemical properties of these four trinuclear clusters in the DMSO-based solvent system were explored and are novel findings.

Key words: Tri-nuclear clusters, electrodeposition, Cyclic Voltammetry

1. Introduction

The history of tri-nuclear clusters began with the discovery of homonuclear metal-metal