

Accepted Manuscript

Structural and electrochemical properties of recycled active electrodes from spent lead acid battery and modified with different manganese dioxide contents

S. Rada, D. Cuibus, H. Vermesan, M. Rada, E. Culea



PII: S0013-4686(18)30440-7

DOI: [10.1016/j.electacta.2018.02.135](https://doi.org/10.1016/j.electacta.2018.02.135)

Reference: EA 31330

To appear in: *Electrochimica Acta*

Received Date: 5 May 2017

Revised Date: 2 October 2017

Accepted Date: 24 February 2018

Please cite this article as: S. Rada, D. Cuibus, H. Vermesan, M. Rada, E. Culea, Structural and electrochemical properties of recycled active electrodes from spent lead acid battery and modified with different manganese dioxide contents, *Electrochimica Acta* (2018), doi: 10.1016/j.electacta.2018.02.135.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Structural and Electrochemical properties of recycled active electrodes from spent lead acid battery and modified with different manganese dioxide contents

S. Rada^{1,2}, D. Cuibus¹, H. Vermesan¹, M. Rada², E. Culea¹

¹Department of Physics & Chemistry, Technical University of Cluj-Napoca, 400020, Romania

²Nat. Inst. For R&D of Isotopic and Molec. Technologies, Cluj-Napoca, 400293, Romania

Abstract

Samples of MnO₂ incorporated into active electrodes structure of the disassembled car batteries were prepared by classical melt-quenching method. The effect of MnO₂ concentration on host network were investigated by X-ray diffraction (XRD) analysis, InfraRed (IR), UltraViolet-Visible (UV-Vis), Photoluminescence (PL) and Electron Paramagnetic Resonance (EPR) spectroscopy, measurements of Cyclic Voltammetry (VC).

X-ray diffractograms show the presence of the metallic lead in the cubic structure and small amounts of PbO₂ crystalline phase with the orthorhombic structure in the metallic samples.

Combining all of the outputs from different characterizations, we can conclude that the amount of MnO₂ incorporated into structure of the recycled active electrodes has effect on the number of non-bridging oxygen atoms that determines the role of MnO₂ as a modifier/network former. At lower MnO₂ contents, the doping breaks Pb-O-Pb bonds producing the formation of [MnO₆] structural units in which the Mn⁺² ions are in octahedral symmetry, gap energy value increases and the effect of luminescence is quenched. At higher MnO₂ content, MnO₂ plays a network former role, joins the vitroc ceramic network as [MnO₄] and [MnO₆] structural units and the PL intensity increases.

The sample doped with small MnO₂ content (x=5mol%) used as working electrode in the measurements of cyclic voltammetry shows a good reversibility of the voltammogram, also improved the electrochemical properties, namely an increased stability in acidic electrolyte environments and offers an alternative for obtaining of electrodes for rechargeable batteries.

Keywords: lead-acid battery, MnO₂, lead recycling, XRD, FTIR, UV-Vis, PL and RES spectroscopy, cyclic voltammetry.

Download English Version:

<https://daneshyari.com/en/article/6603816>

Download Persian Version:

<https://daneshyari.com/article/6603816>

[Daneshyari.com](https://daneshyari.com)