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

Simona Rada[1,2], C Denisa[1], H Vermesan[1], M Rada[2], P Pascuta[1] and **E Culea[1]**
[1]Technical University of Cluj-Napoca, Romania
[2]National Institute for Research and Development of Isotopic and Molecular Technologies, Romania

Manganese (IV) oxide was widely studied due to their technological importance for catalytic and electrochemical applications. The addition of MnO_2 to the active electrodes structure of the disassembled car battery is expected to give new possibilities to extend the properties of these materials by modifying their structure. The structural role of manganese ions in many oxide glasses is unique. These ions exist in different valence states with different coordination numbers simultaneously in the host network, which is mainly responsible for significant changes in the structure and physical properties. MnO_2 incorporated into active electrodes structure of the disassembled car batteries were prepared by classical melt-quenching method. The effect of MnO_2 concentration on the obtained samples was investigated by X-ray diffraction (XRD) analysis, Fourier Transform InfraRed (FTIR) spectroscopy and measurements of Cyclic Voltammetry (CV). The analysis of IR data shows that at lower MnO_2 contents, MnO_2 breaks Pb-O-Pb bonds and produces to the formation of non-bridging oxygen atoms together with the defects known as dangling bonds. At higher MnO_2 content, MnO_2 plays a network former role, joins the vitrocreamic network as $[MnO_4]$ and $[MnO_6]$ structural units. The main reactions for the cathode and anode respectively can be expressed as:

Cathode: $HPbO_2^- + H_2O + 2e^- \rightarrow Pb + 3\ HO^-$ E_C=-0.54V
Anode: $Pb + 2\ HO^- \rightarrow PbO + H_2O + 2e^-$ E_A=+0.58V
Overall cell reaction: $HPbO_2^- \rightarrow PbO + HO^-$ $E=E_C-E_A$=-0.54-0.58=-1.12V
In this case, the potential difference, E between cathodic and anodic reaction is -1.12V.

Biography

Simona Rada is currently working as a Professor in the Department of Physics and Chemistry, Faculty of Material Engineering and Environment, Technical University of Cluj-Napoca, Romania. She completed her PhD in Chemistry with Inorganic Chemistry specialization. She has been part of many international conferences and published many scientific papers in many reputed journals.

simona.rada@phys.utcluj.ro

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