



Contribution ID : 29

Type : not specified

Electrolytic manganese dioxide from secondary sources suitable for energy storage applications

Recycling of material from secondary/spent catalysts is utmost essential in the present day¹. A novel approach has been made to synthesize electrolytic manganese dioxides (EMD) from secondary sources², such as manganese cake (EMDCake), manganese leach residue (EMDLR) and cobalt manganese bromide spent catalyst sludge (EMDCMBS). The synthesized materials were characterised using various physico-chemical techniques. X-ray diffraction pattern confirmed the presence of γ -phase in all the cases. TEM analysis suggests the presence of needle like grains within the range of 20-40 nm. Electrochemical characterisation carried out by galvanostatic charge-discharge technique revealed that the initial discharge capacity of EMDCake, EMDLR and EMDCMBS were 280, 267 and 240 mAh g⁻¹ respectively in 9M KOH in Zn/MnO₂ system. The chemical composition of the EMDs were determined and compared with the BIS standard³ (Bureau of Indian standard, 1996). All the materials found to be suitable for alkaline primary battery applications. The synthesized EMDs are quasi-reversible with continuous charge/discharge cycling.

1. W. Zhang and Y. C. Chu, Hydrometallurgy, 89 (2007) 137.
2. A. Biswal, B. C. Tripathy, K. Sanjay, T. Subbaiah, and M. Minakshi, RSC Adv. 5 (2015) 58255.
3. Bureau of Indian Standard 1996, "Manganese dioxide for dry batteries", IS-11153.

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