Accepted Manuscript

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PII: S0925-8388(16)31220-8

DOI: 10.1016/j.jallcom.2016.04.242

Reference: JALCOM 37440

To appear in: *Journal of Alloys and Compounds*

Received Date: 10 March 2016

Accepted Date: 23 April 2016

Please cite this article as: V.C. Lokhande, A.C. Lokhande, C.D. Lokhande, J.H. Kim, T. Ji, Supercapacitive composite metal oxide electrodes formed with carbon, metal oxides and conducting polymers, *Journal of Alloys and Compounds* (2016), doi: 10.1016/j.jallcom.2016.04.242.

Supercapacitive composite metal oxide electrodes formed with Carbon, Metal Oxides and Conducting Polymers.

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Abstract

Supercapacitors have garnered much attention as energy storage devices. In this article review of most popularly studied metal oxide electrode materials are reviewed with the recent developments. The metal oxides in pristine form have not been able to achieve performance characteristics required for practical applications therefore, composite electrode are also studied. The composite electrode works mainly on the synergistic properties of two or more materials which complement each other and consequently perform better than one electrode. Carbon and carbon derivatives are the most popular option for the composite electrodes. The nanostructuring of the electrode materials has a positive effect on the electrode performance. Understanding of charge storage mechanism is important and needs to be considered while working on nanoscale. The review focuses on the charge storage mechanism, composite electrodes and nanostructuring of the electrodes which ultimately result in better supercapacitive performance.

Keywords: Supercapacitor, metal oxides, carbon, conducting polymers, nanostructures, composites

1. Introduction:

Considering the rising global energy needs and the importance of using renewable clean energy, it has become vital to develop a sustainable energy model. This model will decide how the energy demands will be met globally. Energy storage plays an intricate and indispensable part of this model. Currently, batteries are dominating the energy storage market. However, what batteries lack are higher power density, higher number of charge-discharge cycles and higher rates of