**Annexure – VIII**

**UNIVERSITY GRANTS COMMISSION**
**BAHADUR SHAH ZAFAR MARG**
**NEW DELHI – 110 002**

**PROFORMA FOR SUBMISSION OF INFORMATION AT THE TIME OF SENDING THE FINAL REPORT OF THE WORK DONE ON THE PROJECT**

1. Title of the Project **Studies on hybrid electrochemical supercapacitor based on nanostructured manganese oxide**
2. NAME AND ADDRESS OF THE PRINCIPAL INVESTIGATOR **Dr. R. S. Patil**
3. NAME AND ADDRESS OF THE INSTITUTION **Vivkeanand College, Tarabai Park, Kolhapur**
4. UGC APPROVAL LETTER NO. AND DATE: **47-424/12(WRO)**
5. DATE OF IMPLEMENTATION **1st April 2013**
6. TENURE OF THE PROJECT **2 years**
7. TOTAL GRANT ALLOCATED **1,40,000/-**
8. TOTAL GRANT RECEIVED **1,15,000/-**
9. FINAL EXPENDITURE **1,33,586/-**
10. TITLE OF THE PROJECT **Studies on hybrid electrochemical supercapacitor based on nanostructured manganese oxide**
11. OBJECTIVES OF THE PROJECT
    - Optimization of preparative parameters to synthesize $MnO_2$-PANI composite thin film
    - Study of structural, morphological and optical properties of $MnO_2$-PANI composite thin film
    - To study electrochemical properties of synthesized $MnO_2$-PANI composite thin film
12. WHETHER OBJECTIVES WERE ACHIEVED **Yes**
13. ACHIEVEMENTS FROM THE PROJECT **1 paper submitted**
14. SUMMARY OF THE FINDINGS

Synthesis of nanocomposite materials with high electrochemical performance along with low cost is desirable for applications as electrode materials

in supercapacitor. In this study, a one pot co-electrodeposition method is employed for the synthesis of manganese dioxide-polyaniline (MNP) nanocomposite thin films. The effects of molar concentration of the precursors, manganese ions and aniline monomer, on the structure, composition, morphological and their electrochemical performance is investigated for the first time. The synthesized MNP thin film with 0.08M manganese ions and 0.02M aniline monomer (MNP-41) exhibits a unique morphology of coral like structure, an enhanced specific capacitance of 680 F.g-1, and energy density of 34 Wh.kg-1. In addition, a multistep electron transfer mechanism for the formation of MNP-41 thin films by one pot co-electrodeposition of manganese dioxide over the polyaniline is proposed. The results presented here may lead to new strategy for the synthesis of nanocomposite materials with improved electrochemical performance for energy storage.

15. CONTRIBUTION TO THE SOCIETY

There are few groups in India working in the field of supercapacitor. However, research groups at Indian Institute of Technology, Madras, Indian Institute of Science, Bangalore, Central electrochemical research institute , Karaikude, Naval Materials Research Laboratory, Ambarnath, National Chemical lab., Pune and our group from Shivaji University, Kolhapur are engaged in the development and characterization of electrochemical supercapacitor. The carbon based materials, transition metal oxides, conducing polymers thin films are being developed and studied by these groups; and the techniques used for deposition of these films by the said groups are chemical bath deposition method, electrodeposition, chemical methods, microemulsion techniques, hydrothermal method etc. However, these many of these technique require sophisticated instruments with high temperature and takes 30 min to 72 hours of deposition for the synthesis of supercapacitor electrode material.

In this work, we have strategized the synthesis of $MnO_2$-PANI (MNP) composite thin films by one pot co-electrodeposition method. The electrochemical performance of the synthesized composites resulting from different molar ratio of the Mn precursor and aniline monomer were tested. The effect of molar ratio on the

structure, morphology and electrochemical performance of the synthesized MNP thin films as a potential electrode material in supercapacitor application is being investigated.

16. WHETHER ANY PH.D. ENROLLED/PRODUCED OUT OF THE PROJECT: **No**
17. NO. OF PUBLICATIONS OUT OF THE PROJECT: **One paper is submitted to Journal of power sources.**

**(PRINCIPAL INVESTIGATOR)**

**(PRINCIPAL)**

**(Seal)**

PRINCIPAL
Vivekanand College,
Kolhapur.

**Co-INVESTIGATOR**

Professor,
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