**Chemical Bath (CBD) Synthesized Transition Metals/GO Composites Oxides Nanomaterials for Supercapacitive Electrodes**

Raphael M. Obodoa,b,c, Hope E Nsudea Edwin Onoha, Ishaq Ahmadb,c,e, M. Maazad,e and Fabian I. Ezemaa,d,,e,f[[1]](#footnote-1)\*

aDepartment of Physics and Astronomy, University of Nigeria, Nsukka, 410001, Enugu State, Nigeria

bNational Center for Physics, Islamabad, 44000, Pakistan.

cNPU-NCP Joint International Research Center on Advanced Nanomaterials and Defects Engineering, Northwestern Polytechnical University, Xi'an, 710072, China

dNanosciences African Network (NANOAFNET) iThemba LABS-National Research Foundation, 1 Old Faure Road, Somerset West 7129, P.O. Box 722, Somerset West, Western Cape Province, South Africa**.**

eUNESCO-UNISA Africa Chair in Nanosciences/Nanotechnology, College of Graduate Studies, University of South Africa (UNISA), Muckleneuk Ridge, P.O. Box 392, Pretoria, South Africa

fAfrica Centre of Excellence for Sustainable Power and Energy Development (ACE-SPED), University of Nigeria, Nsukka

**Abstract**

CBD synthesized electrodes were produced for usages in supercapacitors. Graphene oxide (GO) was incorporated in the nanocomposites used for electrodes synthesis due to its great surface area and electrical conductivity. The synergistic alliance among these composites and GO enhance electrodes performance, life span and stability. The structural properties as obtained from the X-ray diffraction (XRD) results suggest that nanocomposites are crystalline in nature. The morphological studies indicated that the nanocomposites have platelet nanoparticles with some agglomerations. The energy bandgaps estimated for the Co3O4/GO, MnO2/GO, NiO/GO and Co3O4/MnO2/NiO/GO were 2.38eV, 2.05 eV, 2.50 eV and 2.33 eV respectively. The electrochemical studies provided highest specific capacitance from CV using 10 mV/s scan rates and GCD using 1.0 A/g current density were 765, 1215, 1518, 1674 and 975, 1358, 1432, 1718 F/g for Co3O4/GO, MnO2/GO, NiO/GO and Co3O4/MnO2/NiO/GO respectively. These results obviously indicate that composites perform better than single transition metal oxide and the addition of graphene oxide enhanced electrodes performance.

**Key Words:** CBD, Electrodes,Graphene Oxide, Supercapacitor, Electrodes.

1. \*Author to whom corresponding should be addressed (F.I. Ezema):

   E-mail address: [raphael.obodo@unn.edu.ng, fabian.ezema@unn.edu.ng](mailto:raphael.obodo@unn.edu.ng,%20fabian.ezema@unn.edu.ng),

   +2348036239214 or +2348037321864 [↑](#footnote-ref-1)