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Synthesis, Structural, and Electrochemical Stability Studies of Nanocrystalline 5V Lithiated Oxides for Asymmetric Supercapacitor WILLIAM PARKER[1], Southern University and A&M College, HUIMING WU, Southern University, RAMBABU BOBBA[2], Southern University and A&M College — For the development of asymmetric (hybrid) supercapacitor, we have synthesized nanoscale double substituted $LiNi_YCo_{1-2Y}Mn_{1+Y}O_4$ (Y=0.05, 0.1, 0.25 and 0.45) spinels using mechanochemical, hydrothermal, microwave assisted combustion aided procedures. The samples have been characterized by XRD, TEM, and XAFS. Lattice parameter of the spinels increased with nickel content, and decreased from 400 to 600 $^\circ$C, at which temperature the particle size is $\approx$20nm. The sample with composition $LiNi_{0.45}Co_{0.1}Mn_{1.45}O_4$ has shown the best electrochemical performance, with redox potential of 4.6V, capacity of 129.6mAhg^{-1}, cyclability of 99.6% per cycle, and retained the capacity up to 1 C rate. The XANES of Mn and M as a function of x showed that the high voltage ($\sim$5 V) in the cathode materials of an Li secondary battery is due to the oxidation of M^{3+} to M^{4+} (M=Co) and M^{2+} to M^{4+} (in the case of M=Ni). The EXAFS analysis revealed that Ni^{2+} is oxidized to Ni^{4+} via the Ni^{3+} state with a Jahn–Teller distorted Ni^{3+}–O octahedron. A hybrid device employing nanostructured $LiNi_YCo_{1-2Y}Mn_{1+Y}O_4$ /polymer electrolyte/nanoporous carbon black (NCB) powders was assembled. grant # W911NF-07-1-0426

[1]UG Physics
[2]Faculty Advisor

William Parker
Southern University and A&M College

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