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A Three-Dimensional reduced Graphene Oxide/Nickel Oxide Composite in a Thin, Porous Carbon Framework to serve as a Supercapacitor Electrode GYEONGHEE LEE, Prof. Jie Liu Laboratory, Department of Chemistry, Duke University, C.V. VARANASI, Army Research Office, Research Triangle Park, JIE LIU, Department of Chemistry, Duke University — In recent years, environmental problems and the depletion of fossil fuels have encouraged intense research to discover ways to store energy such as supercapacitors. NiO is considered as a highly promising candidate for electrodes in supercapacitors due to its high theoretical capacitance, superior stability in alkaline electrolytes and low cost. However, the poor conductivity of NiO limited its capacitance to low value. In this work, NiO coated reduced graphene oxide (rGO) network in a conductive carbon matrix was synthesized. A porous carbon paper (CP) was utilized as a conductive framework on which initially $Ni(OH)_2$ was vertically grown via solvothermal reaction. Graphene oxide (GO) hydrogel was formed on the $Ni(OH)_2$ coated carbon paper through the dissolution of $Ni(OH)_2$. Controlling the uniformity of $Ni(OH)_2$ coating on the carbon paper was a key factor to homogeneous loading GO onto the carbon paper. $Ni(OH)_2$ was loaded again on GO hydrogel formed on the carbon paper (CP-GO-$Ni(OH)_2$) as NiO precursor. After annealing, CP-rGO-NiO composite exhibited a high specific capacitance and excellent cycle stability compared to the electrochemical performance of rGO-NiO composite connected to a carbon paper using binder. The structural and electrochemical properties of CP-rGO-NiO composite will be presented.

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