EW-P003

Pseudocapacitive Behavior of Lignin Nanocrystals Hybridized onto Reduced Graphene Oxide for Renewable Energy Storage Material

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As the society demands the high performance energy storage devices, development of efficient and renewable energy storage materials has been a topic of interest. Here, we report pseudocapacitive behaviors of biopolymer (lignin) that was confined onto reduced graphene oxides (RGOs) for a renewable energy storage system. The strong surface confinement of quinone groups onto the electroconductive RGOs created the renewable hybrid electrodes for supercapacitors (SCs) with fast and reversible redox charge transfer. As a result, the pseudocapacitors fabricated with the hybrid electrodes of lignin and RGO presented the outstanding electrochemical performances of remarkable rate and cyclic performances:～4% capacitance drop after 3000 cycles and a maximum capacitance of 432 F g-1.

Keywords: Pseudocapacitor, Lignin, Reduced graphene oxide

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Synthesis of Vertically Aligned SiNW/Carbon Core-shell Nanostructures

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Carbon-based materials such as carbon nanotubes and graphene have emerged as promising building blocks in applications for nanoelectronics and energy devices due to electrical property, ease of processability, and relatively inert electrochemistry. In recent years, there has been considerable interest in core-shell nanomaterials, in which inorganic nanowires are surrounded by inorganic or organic layers. Especially, carbon encapsulated semiconductor nanowires have been actively investigated by researchers in lithium ion batteries. We report a method to synthesize silicon nanowire (SiNW) core/ carbon shell structures by chemical vapor deposition (CVD), using methane (CH4) as a precursor at growth temperature of 1000～1100°C. Unlike carbon-based materials synthesized via conventional routes, this method is of advantage of metal-catalyst free growth. We characterized these materials with FE-SEM, FE-TEM, and Raman spectroscopy. This would allow us to use these materials for applications ranging from optoelectronics to energy devices such as solar cells and lithium ion batteries.

Keywords: Silicon nanowires, Carbon, Chemical vapor deposition