Fabrication of nanoarchitectured TiO_2(B)@C/rGO electrode for 4 V quasi-solid-state nanohybrid supercapacitors

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More and more transition metal compounds have been evaluated systemically as anodes for HEV device. [1] Among them, titanium based insert hosts are considered as alternative anodes due to their excellent cycle life and rate capability. Hyperdispersed TiO_2(B) nanocrystals on carbon nanotubes exhibited an excellent power capacity with 235 mAh/g delivered at 300 C. TiO_2(B) nanowires coated with mesoporous carbon exhibit a high reversible capacity of 560 mAh/g. [2] Even many hybrids of TiO2(B) have been explored, complicated nanohybrids are still desired greatly to exhibit novel synergistic properties and improved performances.

Novel TiO_2(B)@C/rGO nanoarchitectures are fabricated by combining hydrothermal treatment, ions exchange, and topological phase transformation as well as carbon modification.[3] Asymmetric hybrid Li ion nanohybrids supercapacitors with high energy and power densities are constructed by combining hybridized TiO_2(B) anode, activated carbon (AC) as EDLC type cathode and the employment of high-voltage formulated ionic liquids electrolyte as well as ionogel polymer separator. Such a balanceable and complementary design between electrode and electrolyte allow rapid ion and electron transport in ionic liquid-based electrolyte and hybridized electrodes. The quasi-solid-state 4V TiO_2(B)@C/rGO device shows a high energy density of 59.4 W h/kg and 17.3 kW/kg when the working temperature was increased to 40 ℃. These results clearly demonstrate that high performance nanohybrid supercapacitors can be actualized through the subtle combination of nanohybridized electrodes and high voltage formulated ionic-liquid/lithium-salt electrolytes, which make them promising power-type energy storage devices for HEV.

References:

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