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High Performance Wearable/Flexible Energy Storage Devices Based on Ultrathin $Ni(OH)_2$ Coated ZnO Nanowires

Imran Shakir[1], Jongjin Park[2], Dae Joon Kang[1]

[1]BK21 Physics Research Division, Department of Energy Science, Institute of Basic Science, Sungkyunkwan University, Suwon 440-746, Republic of Korea, [2]Frontier Research Lab., Samsung Advanced Institute of Technology, Yongin, Republic of Korea

A simple solution-based method is developed to deposit crystalline ultrathin (2 nm) nickel hydroxide on vertically grown ZnO nanowires to achieve high specific capacitance and long-term life for flexible and wearable energy storage devices. Ultrathin crystalline $Ni(OH)_2$ enables fast and reversible redox reaction to improve the specific capacitance by utilizing maximum number of active sites for the redox reaction while vertically grown ZnO nanowires on wearable textile fiber effectively transport electrolytes and shorten the ion diffusion path. Under the highly flexible state $Ni(OH)_2$ coated ZnO nanowires electrode shows a high specific capacitance of 2150 F/g (based on pristine $Ni(OH)_2$ in 1 M LiOH aqueous solution with negligible decrease in specific capacitance after 1000 cycles. The synthesized energy-storage electrodes are easy-to-assemble which can provide unprecedented design ingenuity for a variety of wearable and flexible electronic devices.

Keywords: ZnO, $Ni(OH)_2$, Supercapacitor