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Nano-ceramics for energy storage applications

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Supercapacitors are considered one of the most prominent and efficient energy storage devices, next to lithium ion batteries due to their high power densities, fast charge-discharge capabilities and long cyclibility. Supercapacitors possess high power density in compare to batteries and are able to solve the increasing demand for energy in small consumer products, electrical vehicles and devices where quick power delivery is highly desired. We have used several facile methods to synthesized nanostructured ceramics such as NiCo2O4, Fe3O3 and CoMoO4. The electrochemical properties of these metal oxides were studied in details. It was observed that the charge-storage capacity depends on their morphology and electrolytes used. We have fabricated flexible supercapacitor device by using these metal oxides. The device showed no degradation in the capacitive properties on bending confirming their flexible nature. We have also studied the effect of temperature on the charge storage capacity of the devices for high temperature applications. The specific capacitance of the device significantly increased when the operational temperature of the device was elevatedfrom10 to 70oC. Hence, this work provides facile methods to synthesize morphologies controlled metal oxides for applications in next generation flexible energy storage devices which could drive more efficiently at higher temperature.

Biography

Ram Gupta joined Pittsburg State University as an Assistant Professor in 2013. Before joining to Pittsburg State University, he worked as an Assistant Research Professor at Missouri State University, Springfield, MO then as a Senior Research Scientist at North Carolina A&T State University, Greensboro, NC. His research focuses on green energy production and storage using nanomaterials, optoelectronics and photovoltaics devices, organic-inorganic hetero-junctions for sensors, nanomagnetism, conducting polymers and composites. He has published over 130 articles in peer-reviewed journals and presented/attended more than 100 conferences. He is an Editorial Board Member and reviewer for various leading science journals.

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