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SYNTHESIZING NICKEL-BASED TRANSITION BIMETALLIC OXIDE VIA NICKEL PRECURSOR-FREE HYDROTHERMAL REACTION FOR BATTERY SUPER-CAPACITOR HYBRID DEVICES

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The Ni foam can act as the source of nickel ions and current collector for synthesizing Ni-based compounds using a hydrothermal reaction especially in acid condition. Using Ni foam as the Ni^{2+} source can grow materials on the substrate directly and uniformly since nickel ions are released from substrate thoroughly. Nickel-based bimetallic oxides are intensively investigated as battery-type materials for battery supercapacitor hybrid devices (BSHD) because of high electrical conductivities and abundant transition states for inducing multiple redox reactions. In this study, Mo, Mn, Al, and W precursors are simply added in Ni precursor-free acid solution for hydrothermal reaction using nickel foam as source of nickel ions and current collector to synthesize Ni-based bimetallic oxide electrodes for BSHD. The morphology of nickel-based bimetallic oxide prepared with and without incorporating structure-directing agent is also carefully discussed. The highest specific capacitance (C_F) of 1.80 F/cm^2 corresponding to the capacity of 4.54 mAh/cm^2 at 5 mA/cm^2 is attained for nickel molybdenum oxide (Ni-Mo oxide) electrode, while the Ni-Mo oxide-based BSHD shows a potential window of 1.8 V, a C_F value of 223.53 mF/cm^2 corresponding to the capacity of 1.45 mAh/cm^2 at 5 mA/cm^2, the maximum energy density of 4.60 Wh/kg at power density of 0.21 kW/kg, and the C_F retention of 90% after 6000 times charging/discharging process.

Biography

Lu-Yin Lin has completed her PhD from the Department of Chemical Engineering in National Taiwan University, under the Supervision of Professor Kuo-Chuan Ho. Her research is on Dye-sensitized solar cells. She has continued her Postdoctoral studies in Department of Chemistry in UC Berkley University, under the Supervision of Professor Pei-Dong Yang. She is currently an Associate Professor in the Department of Chemical Engineering in National Taipei University of Technology, Taiwan. Her research is focused on Electrochemistry, including energy generation and storage devices. She has published more than 80 SCI journal papers in reputed journals.

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