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Electrode Behaviors of $BiFeO_3$ Powders: A Possible Application of Bi_2O_3 Oxide in Rechargeable Battery

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Pure phase $BiFeO_3$ nanopowders were successfully prepared by a sol-gel method. The phase structure and morphology were characterized by XRD and SEM analysis technique. For the first time, the electrochemical properties of $BiFeO_3$ nanopowders were evaluated as anode materials for the alkaline secondary batteries. The results indicate that as-prepared $BiFeO_3$ oxides are perovskite-type nanopowders with high crystallinity. As negative electrode in $Ni(OH)_2$ / $BiFeO_3$ battery, the $BiFeO_3$ oxides irreversibly decompose into Bi_2O_3 and Fe_2O_3 in the initial charge-discharge cycling., In subsequent cycles, both of Bi_2O_3 and Fe_2O_3 oxides act as effective electrode materials in designed battery system. The pure Bi_2O_3 shows the best performance by comparing the electrochemical properties among $BiFeO_3$, Bi_2O_3 and Fe_2O_3. The maximum discharge capacity of Bi_2O_3 electrodes is 285 mAh/g, and the capacity retention after 20 charge-discharge cycles is 87%, indicating that it is a promising electrode material in alkaline rechargeable battery.

Keywords: Perovskite-type oxide, $BiFeO_3$, Bi_2O_3, Decomposition, Electrode properties.

FULL TEXT