Nickel oxide performance as anode material for Lithium Ion Batteries

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Lithium ion batteries, as a rechargeable power source, have attracted much more attention due to their extensive applications in portable electronic devices and electric vehicles. Although most commercial Li-ion batteries use graphite as anode, a variety of materials have been investigated in order to increase the cell capacity, and therefore its specific energy. Some of these materials are transition metal oxides, which are able to store more Li per gram than graphite and to improve their specific capacities. In this respect, special attention has been given to Fe, Co, and Ni based oxides [1-3].

Particularly, NiO is one of the promising anode materials for Li -ion batteries because of its low cost, environmental friendless and high theoretical capacity values (718 mA h g^{-1} for $2Li^{+}$per NiO).Various NiO components with different structures such as mesoporous, nanosheet, networks, nanowall, nanotube and hollow microsphere have been successfully fabricated [4-5].

In this work, the preparation and characterization of nickel oxide as anodes materials in lithium-ion batteries are presented. Two processes are involved in the synthetic procedure; in the first step the nickel hydroxide was obtained by hydrothermal synthesis (4h, 180°C) and then the precipitated was washed with distilled water to remove the residual species. The second step consists of the material calcinations in air at 300ºC, for 4 (NiO-4h) and 24(NiO-24h) hours.

The structural characteristics and electrochemical properties of the obtained nickel oxides are subsequently investigated by optical and electrochemical techniques such as: FTIR, SEM, charge-discharge cycles, galvanostatic discharge at different currents and cyclic voltammetry.

The anode materials (NiO-4h and NiO-24h) were synthesized via a facile two-step route and exhibit a satisfactory specific capacity, cyclability and rate capability (Figure 1). These results indicate that the studied electrodes could be suitable as anodes in lithium ion batteries applications.

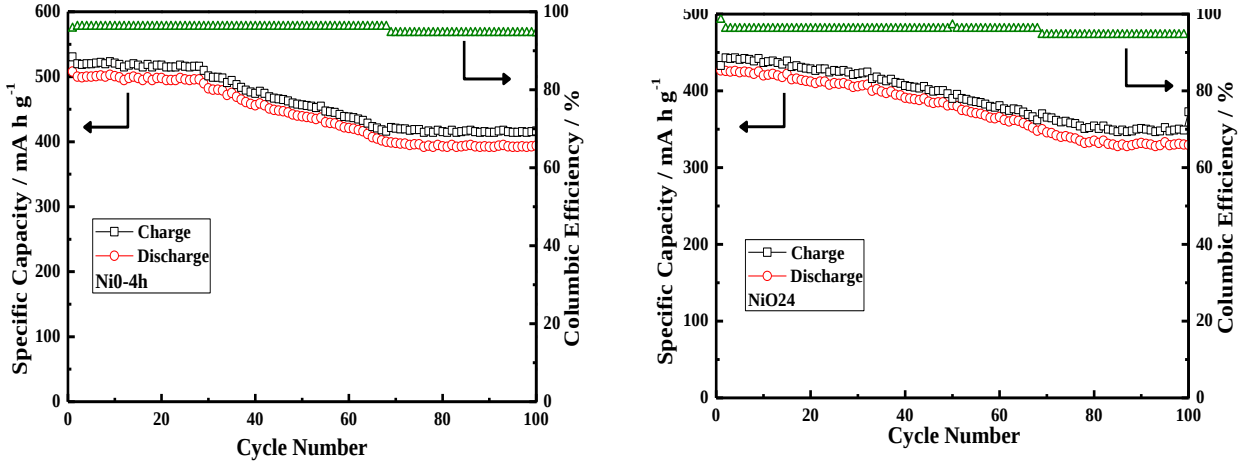

Figure 1. Cycle capacity of the NiO-4h and NiO-24h materials, at 0.5C

Keywords: Nickel oxide, anode materials, lithium ion batteries.

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