NiO/MWNTs Composite as Anode Material for Lithium-ion Batteries

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In recent years was reported the investigation of negative electrodes made of nanoparticles of metal oxide (MO), where M = Co, Ni, Cu or Fe and it is found an excellent cycling and capacity of 700 mAh g^{-1}. Thus, several research groups investigating the synthesis of (nano) particulate metal, to obtain new materials with different morphologies. These materials were applied as anodes or cathodes for Li-ion batteries among them the NiO prepared by the method of spray pirolysis. It is also known that the MWNTs provides a good stability but a relatively low capacity when used as anode for Li-ion batteries. In this work a type NiO: MWNTs composite was prepared and evaluated as anodes for Li-ion batteries. The powder of the NiO obtained by spraying a solution of 0.50 mol L^{-1} $NiNO_3.6H_2O$ to 600 ° C was characterized by X-ray diffraction (XRD). All peaks could be perfectly indexed to crystalline cubic structure of NiO, indicating that no impurities in the powder of NiO prepared. The morphology and size of NiO particles were characterized by scanning electron microscopy, which can be seen that the morphology presented in the form of spherical balls. The reversibility of Li-ion charge/discharge was examined at a current of the 50 mA g^{-1} in the range from 0.01 to 3.00 V (vs. Li/Li^+) for NiO MWNTs composites :in different reasons (% m / m) of the constituents. For the first cycle it is observed that the charge capacity of lithium is increased with increasing percentage of MWNTs in the sample, reaching a maximum between 30 and 50%, and that this capacity is reduced when the amount of nanotubes is high, greater or equal to 80%. In general, the capacity decreases with cycling, but when the content of carbon is increased it is observed that they tend to better stability during subsequent cycles. After 20 cycles the capacity of NiO electrodes remained around of 191 mAh g^{-1}, representing about 22% of initial capacity. For composites NiO:MWNTs inn the proportion of 70:30, after 20 cycles, the capacity remained around 320 mAh g^{-1}, corresponding to 37% of initial capacity, showing that with the addition of MWNTs in the composite there is a significant increase in the conservation of energy.