

Hydrothermal preparation of Fe₂O₃/CuO and Co₃O₄/CuO composites with potential application as anodes in Lithium ion batteries

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Lithium-ion batteries have attracted the attention in the electronics area as a result of their high energy and power density, long life, and for being environmentally friendly. For that reason, the study of new materials to be used as anodes and cathodes in lithium ion batteries is of great importance.

In the present work we report the synthesis of CuO by sol gel decorated with Co₃O₄ and Fe₂O₃ nanoparticles by the hydrothermal method in order to obtain composites with different size-scale (micro and nano), expecting to obtain good properties for their use as potential anode materials in Lithium-ion batteries.

The SEM characterization reveals the different size of the CuO ($\approx 1.6 \mu\text{m}$), Co₃O₄ ($\approx 700 \text{ nm}$) and Fe₂O₃ ($\approx 200 \text{ nm}$) particles, confirming the effect of the synthesis method on this parameter. Furthermore, the EDS analysis showed the good dispersion of the Co₃O₄ and Fe₂O₃ nanoparticles over the CuO as a result of the decorate. In addition, the XRD patterns confirmed the formation of the expected phases, without the formation of impurities, suggesting the use of this methods as good candidates for the preparation of pure materials.

This difference in the size scale can be positive in their application as anodes in lithium ion batteries due to it will help to obtain a physical coating of uniform matter on the CuO, where the high theoretical specific capacity of Co₃O₄ and Fe₂O₃ will provide an increase in the electrochemical performance of the composites, which in turn will help to support more the volume expansion that occurs in the loading and unloading tests.

Keywords: CuO/Co₃O₄, CuO/Fe₂O₃, lithium ion batteries, Physico-chemical characterization.