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Ethylene glycol directed crystal growth of CuO nanowires: Precursor for the preparation of dispersed copper nanocrystals

M. Ait Ali [(1)], A. Outzourhit [(2)], A. Mehdi [(3)], M. Elyaagoubi[(2)]

[(1)] Coordination Chemistry Laboratory, department of Chemistry, Faculty of Sciences semlalia, Marrakech Morocco
[(2)] Solid state physics and thin films laboratory, department of physics, Faculty of Sciences semlalia, Marrakech Morocco
[(3)] Institut Charles Gerhardt, Université Montpellier, UMR5253, CMOS France

E-mail: ahmad.mehdi@univ-montp2.fr

One-dimensional nanostructures are attractive candidates for nanoscience studies as well as nanotechnology applications. Because of the unique density of electronic states, nanowires in the limit of small diameters are expected to exhibit significantly different optical, electrical and magnetic properties from their bulk 3D crystalline counterparts.

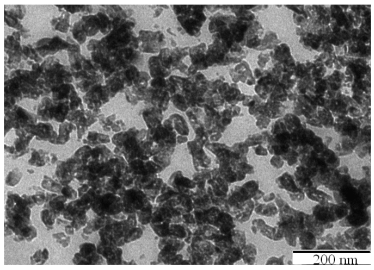
In this work, CuO nanowires with lengths up to 20 nm and a diameter of 2.4 nm have been selectively synthesized. The preparation was performed at room temperature from metallic cupper powder by a facile solution-phase method in the presence of nitric acid and sodium hydroxide (NaOH) and using ethylene glycol (EG) as growth-directing agent. The results showed that under the action of EG molecules, the CuO nanowires were formed through oriented attachment of colloidal particles and self-assembly leading to nanowires. EG plays a critical role in the synthesis of nanowires as it not only prevents the random aggregation of colloidal particles but also helps to orientate nanowire growth by the coalescence and alignment in one direction of the colloidal particles.

Chemical reduction of the obtained CuO nanowires at room temperature using $NaBH_4$ lead to nanostructured copper.

The morphology of the CuO nanowires and nanostructured copper were investigated by scanning electron microscopy (SEM) and transmission electron microscopy (TEM). X-ray diffractions were used to study chemical composition and crystalline structures of the materials.

TEM image of CuO nanowires

$NaBH_4$



TEM image of nanostructured Cu