SCIENCESPRINGDAY

FACULDADE DE CIÊNCIAS E TECNOLOGIA
UNIVERSIDADE NOVA DE LISBOA

Materials Science Department - CENIMAT/I3N

Design of new functional materials

CENIMAT/I3N Microelectronic and Optoelectronic Group

CENIMAT | i3N

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Objectives

The work is centered on the characterization of materials by scanning electron microscopy (SEM) (Figs. 1-4). Moreover, the production of oxide nanowires through wet chemical solution routes (Figs. 2-4).

After improving the nanowire structure, a device employing a single nanowire aligned between the source and drain electrodes is expected to be fabricated.

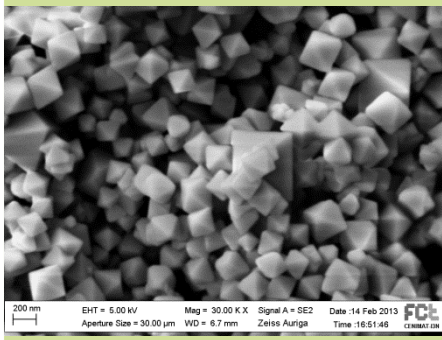

Fig. 1

Methodology

Cu_2O nanowires were synthesized with 0.2 g polyethylene glycol (PEG) and 0.18g copper (II) chloride ($CuCl_2.2H_2O$) dissolved in 200mL water under constant stirring. 1.2mL of 6M sodium hydroxide (NaOH) was added dropwise into the solution resulting in a blue precipitate of $Cu(OH)_2$. 1.5mL of 13.7M hydrazine hydrate ($N_2H_4.H_2O$) was added into the blue solution turning into red. After the $Cu(OH)_2$ reduction (Fig. 2), the red precipitate was washed, and dried in vacuum for 24h.
Copper acetate $(CH_3COO)_2.H_2O$ and NaOH were also used as precursors. Two separate solutions, copper acetate (0.5M) in water and NaOH (5M) were prepared. The precipitate was washed, and dried in vacuum for 12h. The drying temperatures tested were 35, 40 and 60ºC. SEM characterizations were carried out using a Carl Zeiss AURIGA CrossBeam Workstation instrument equipped with an Oxford energy dispersive X-ray spectrometer (EDS).

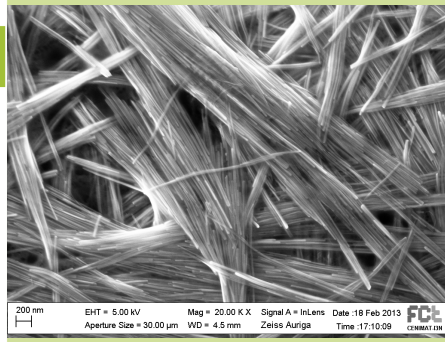

Fig. 2

Expected Results

The goal is to obtain Cu_2O nanowires exhibiting 20-30 μm in length and 50-100 nm in diameter, testing several types of chemical solutions with different concentrations. Subsequently, the integration of the improved nanowire to a thin film transistor is expected with further characterization.

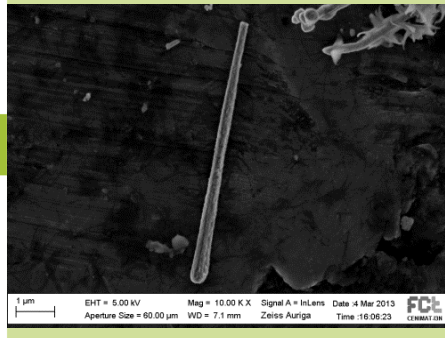

Fig. 3

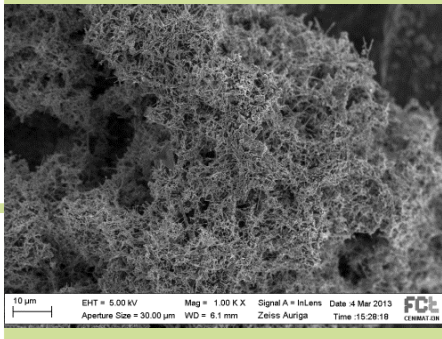

Fig. 4

Funding:

FCT Fundação para a Ciência e a Tecnologia
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SEVENTH FRAMEWORK PROGRAMME

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