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Nanocrystalline Oxides: CdS nanowires synthesized by solvothermal method

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Recent advances in the field of nanotechnology produced an assortment of one-dimensional (1D) structures, such as nanowires and nanorods. These fascinating materials are the potential building blocks for a wide range of nanoscale electronics, optoelectronics, magnetoelectronics, or sensing devices [1]. Parallel to the success with group IV and groups III–V compounds semiconductor nanostructures, semiconducting metal oxide materials with wide band gaps are attracting attention [2-3]. The main aim of this communication is to report our results on the application of several new techniques, particularly the use of hydrothermal synthesis, to fabricate single crystal one-dimensional nanostructured materials, study their growth processes, understand the growth mechanisms and investigate their physical properties. A wide range of remarkable features are then presented, to cover a number of metal oxides, such as ZnO, Sb2O3, CdS, MgO, α-Fe2O3, or TiO2, describing their structures, optical, magnetic, mechanical and chemical sensing properties. These studies constitute the basis for developing versatile applications based on metal oxide 1D systems as well as highlighting the current progress in device development. To exemplify, the as-prepared CdS nanowires have average 28 nm in diameter and length up to several micrometres. The direct band gap of the CdS nanowires is 2.56 eV calculated by the UV-vis absorption spectra. The PL spectrum has two distinct emission bands at 502 nm and 695 nm, which are associated with the near-band-edge emission and defect emission, respectively. These synthesized single-crystal CdS nanowires have a high potential in the optoelectronic applications of nanolasers, solar cells, lighting-emitting diodes or photodetectors. Acknowledgments: Erasmus Mundus MEDASTAR (Mediterranean Area for Science, Technology and Research) Programme, 2011–4051/002–001-EMA2, Spanish MINECO (MAT2010-15094, Factoría de Cristalización – Consolider Ingenio 2010) and ERDF.

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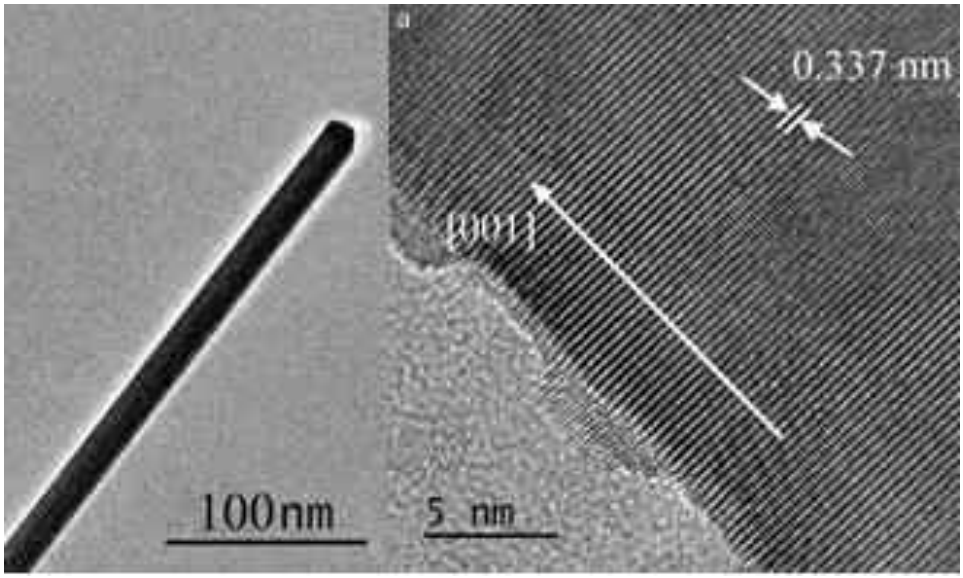

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