Multifunctional ZNO and ZnS nanostructures synthesized by chemical spray method

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The preparation and properties of novel ZnO nanostructures (nanorods, nanoneedles, hierarchical nanorods and scrolled nanobelts) and ZnS nanorod arrays made by simple, robust and non-vacuum chemical spray pyrolysis method will be introduced. ZnO nanostructures are grown on glass and/or polymeric substrates using aqueous or alcohol based solutions of zinc salts [1]; to obtain ZnS nanorod layers thiourea as sulphur source is added into the zinc salt solution [2]. Solution is pulverised in form of fine droplets onto a preheated substrate. The morphology of ZnO, ZnS nanorod layers, dimensions and orientation of crystals are controlled by the growth temperature, precursor concentration and additives in the spray solution which retard the crystal lateral growth. The density of nanorods is controlled by the substrate type and number of the nucleation centers. The growth and nucleation mechanisms of ZnO nanorods and scrolled nanobelts, and formation of hierarchical nanostructures will be discussed. Examples on growth of metal oxide or sulfide shells by solution methods on ZnO nanorod core will be presented. ZnO and ZnS nanorod arrays with different morphology are proposed as building blocks for dye, organic and inorganic absorber sensitized solar cells, light emitting diodes, optical or hydrophilic/hydrophobic coatings, high surface area and photocatalytic activity makes them available for purification of waste waters.

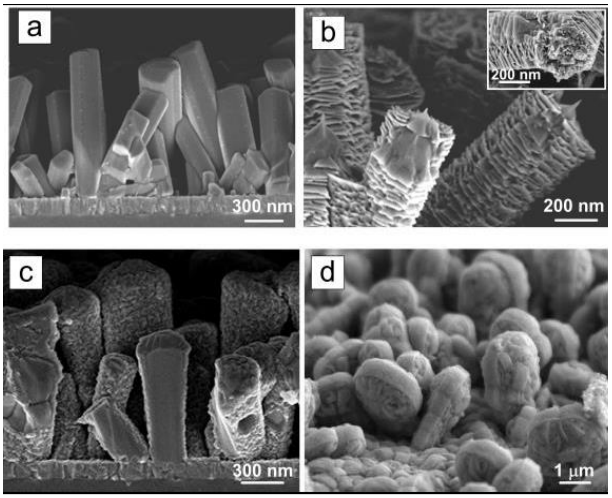

Fig.1 SEM images of ZnO nanostructures deposited by chemical spray pyrolysis: a) ZN nanorods; b) ZnO hierarchical structures; c) In_2S_3 shel on ZnO nanorod core; d) ZnO scrolled nanobelts

References

1. M. Krunks, I. Oja Acik and T.Dedova, US Patent, US8808801B2 (2014)
2. T. Dedova, M. Krunks, I. Gromõko, V. Mikli, I. Sildos, K. Utt and T. Unt, Phys. Status Solidi A **211,** 514 (2014)