



Synthesis and Characterization of Transition Metals Doped Zinc Oxides Nanocrystalline Materials by Solution Based Precipitation Technique.

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Abstract

A green synthesis of pure zinc oxide and transition metal doped zinc oxides such as Mn-ZnO, Fe-ZnO, Co-ZnO, Ni-ZnO and Cu-ZnO has been carried out by solution based precipitation technique. The pure ZnO and transition metal doped ZnO were characterized by FTIR, XRD, FE-SEM and EDS analysis. The FTIR analysis shows the formation of Metal oxide peaks of ZnO and the redshift value of FTIR shows transition metal doped on zinc oxide. The XRD analysis shows formation of highly crystalline hexagonal phase wurtzite structure of ZnO. The XRD of Mn doped ZnO shows presence of pure spinel phases of Mn along with hexagonal ZnO. The XRD of Fe-ZnO/Co-ZnO/Ni-ZnO shows cubic phase of Fe/Co/Ni along with hexagonal ZnO and Cu-ZnO shows monoclinic phase of Cu along with hexagonal ZnO. The FE-SEM images of ZnO shows the agglomerated clumpy particles with size 150-200nm, and the FE-SEM of doped image of Mn-ZnO, Fe-ZnO, Co-ZnO, Ni-ZnO, and Cu-ZnO was found spherical, rectangular and spongy morphology with the particle size 30-40, 35-45, 25-35, 15-25 and 20-30 nm respectively. The EDS analysis is well concurrence with the elemental analysis of transition metal doped ZnO. Overall our methodology for the preparation of nanocrystalline ZnO and transition metal doped nanocrystalline ZnO is easy and environmentally friendly.

Keywords: Solution based technique, ZnO NPs, Mn/Fe/Cu/Ni/Cu doped ZnO, and Characterization of NPs.

Introduction

Nowadays, the synthesis of nano material's and its use as environmentally friendly catalyst for organic transformation [1-2] as well as degradation of organic waste is an important area of research [3-4] in chemistry. Numbers of physicals and chemicals methods are routinely used for the synthesis of nonomaterial such as solution based precipitation technique [5-6], molten salt synthesis technique [7-8], sol-gel method [9-10] and hydrothermal method [11-12] for the find out unique morphology and uniform particle size. It has observed that nanosized materials exhibit altogether superior physical and chemical properties such as magnetic [13], electrical [14], catalytic [15], optical [16] and mechanical properties[17] than large particle sized materials due to their smaller size they have high surface-to-volume ratio that increases the surface leading energy.

Therefore we have used economically cheap and easily available transition metals such as Mn, Fe, Co, Ni and Cu for the doping with ZnO nanomaterials by solution based precipitation technique.