Likewise, the results of the transmittance indicate that the optical energy bandgap is constant for all reactions with a value about 3.29 eV.

Keywords: chemical bath deposition, ZnO, semiconducting materials

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Hydrothermal synthesis of doped ZnO and its application in photodegradation of toxic amaranth dye

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The semiconductors like TiO_2 and ZnO when illuminated under UV or sunlight produce electrons and holes. At the surface these electrons reduce adsorbed oxygen and the holes oxidize organic compounds or adsorbed water molecules. This property can be used to disintegrate toxic organic compounds and treat industrial effluents efficiently for environmental issues. Here, the author reports the synthesis of ZnO under mild hydrothermal conditions (Temperature =150℃, Pressure = Autogenous, Duration = 24 hrs). Several active metals like tungsten, molybdenum, chromium, manganese, etc., was doped in a ratio 1, 3, 5 and 10 %. The compounds synthesized were characterized using powder X-ray diffraction (XRD), Fourier infrared spectroscopy (FTIR), photoluminescence and scanning electron microscopy (SEM). The photodegradation property of these compounds was testified by the degradation of Amaranth Dye of different concentration under both sunlight and UV light. The effect of various parameters such as initial dye concentration, catalyst loading, pH of the medium, source and intensity of illumination on the photocatalytic degradation of Amaranth dye using ZnO doped with various metals were investigated. The photodegradation efficiency of these compounds was calculated by percent transmission (%T) and chemical oxygen demand (COD). The reduction in the COD values and the increase in the %T of the treated dye revealed the complete destruction of the organic molecules present in the Dye. The results obtained are highly encouraging and further work is being carried out for the use of these photocatalytic compounds for other toxic organic decomposition.

Keywords: mild hydrothermal synthesis, toxic organic compounds disintegration, photocatalysis

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Structural characterization of nanostructures hierarchical rare earth doped ZnO colloids

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In the last years, rare earth doped nanometric semiconductors have shown a increased interest in the field of optical communication, phosphors, photonic crystals, displays, etc. In materials science, the properties of the obtained material strongly depends on the synthesis method, requiring a strictly characterization of the obtained material in order to understand the relevant condition that leads to the optimal properties desired. Rare earth doped ZnO was obtained by hydrothermal process and the resulting structures were characterized by X-Ray Diffraction (XRD), Low Angle X-Ray Diffraction (LAXRD), Field Effect Scanning Electron Microscopy (FE-SEM) and Extended X-ray Absorption Fine Structure (EXAFS). The results show an complex hierarchical structure composed by nanobuilding blocks of doped ZnO without phase segregation. The self assembly of this nanocrystals generates a monodisperse colloids that orders in colloidal crystals. A deeper discussion of the results will be show.

Keywords: colloidal crystals, nanoestructured, hierarchical

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Crystal growth peculiarities of new oxide conductor $La_2Mo_2O_9$ in the system La_2O_3 - MoO_3

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$La_2Mo_2O_9$ (LM) is known as a new oxide conductor owing to the potential application as the solid electrolytes. At the phase transition at 580°C cubic phase $P2_13$ turns into monoclinic polar phase $P2_1$ at room temperature. This allows to suppose that the nature of this transition may be ferroelectric-ferroelastic. For study of such properties reasonably large crystals could be obtained. The main goal of this research was the growth of LM crystals in the system La_2O_3 - MoO_3. This task was difficult due to high liquidus temperatures, incongruent melting, and instable growth. As LM melts incongruently, the flux method with spontaneous crystallization in alumina crucible was used. The reagents (La_2O_3 annealed obligatory at 1000°C, MoO_3) were extra pure grade. For each crystal growth run the melt content, eutectic and liquidus temperatures, cooling rate, temperature gradient, the temperature of the crystal nucleation and the morphology of the obtained crystals have been determined. Cooling rates were in the range 0.3-3.0 grad/h at the maximum temperature 1350°C.The known diagram La_2O_3 - MoO_3 have been refined by the crystal growth experiments. The LM crystals have morphologic peculiarities connected with the significant supercooling of the melts. Polycrystalline plates at the melt surface and dendrite-like crystals in the volume of the melt are observed. Attempts to modify the melt by doping (Nd, Zn, B, Ca) were ineffective. Plates consisted of several single crystal grains with sizes near 5x5x3 mm. LM single crystals of such size were obtained for the first time. The work was supported of the grant RFBR No 07-02-00180.

Keywords: crystal growth from solution, $La_2Mo_2O_9$, phase diagrams