Synthesis, characterization and spectroscopic properties of $Nd_2(MoO_4)_3$ microflowers

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Abstract

Rare earth (RE) ion doped phosphors have attracted great interest during the past several decades due to their unique physical and chemical properties. RE ions can display many meaningful properties in optics, electronics, and magnetics, originating from f-f electronic transitions within the 4f shell. Among these RE ions, the Nd^{3+} ion is an important activator that can emit in the near infrared, corresponding to the transition, while located in a non-centrosymmetric site. Molybdates are important inorganic compounds and display some excellent performance in the field of lasers, phosphors and ionic conductors. Thus, many materials doped with Nd^{3+} can be used as infrared emitting phosphors and have potential application like diagnostic, biomarker, image, therapy, etc.

Neodimium compound $Nd_2(MoO_4)_3$ nanoparticles was prepared by co-precipitation route using a dispersor to control the particle shape and size. X-ray diffraction (XRD),scaning eletronic microscopy (SEM), transmission electron microscopy (TEM) and photoluminescence spectra (PL were applied to characterize the obtained samples. The XRD patterns reveal that as prepared sample is assigned to the scheelite-type tetragonal structure and this extructure change with the thermal treatment to a monoclinic phase. In addition, the as-synthesized $Nd_2(MoO_4)_3$ particles are high purity well crystallized and with the crystalite size aproximately 21 nm. The possible formation process of $Nd_2(MoO_4)_3$ nanoparticles have been discussed as well. Upon excitation by ultraviolet radiation, the as-synthesized $Nd_2(MoO_4)_3$ nanoparticles exhibit the characteristic emission lines corresponding to Nd^{3+} ion spectra. It was observed the change in the structure with thermal treatment in the emission spectra. The luminescence spectra show the characteristic narrow bands assigned to 4f–4f transitions from the emitting $^4F_{3/2}$ level to the $^4I_{9/2}$ and, $^4I_{11/2}$ levels, centered around 915 and 1060 respectively.

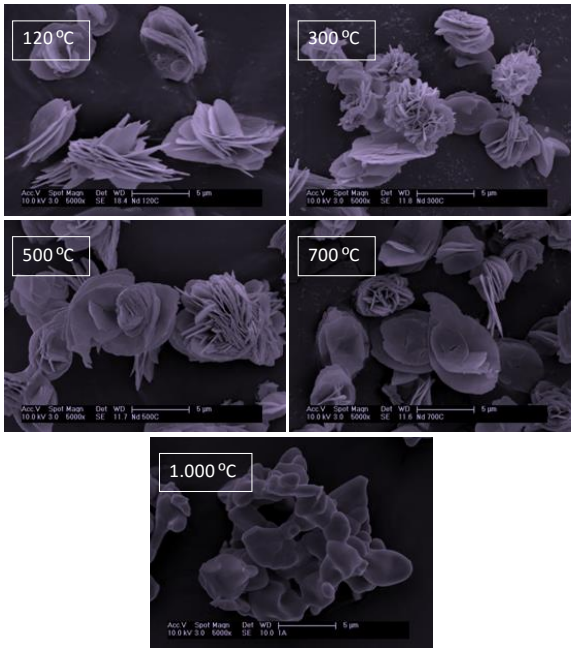

FIGURE. SEM image of $Nd_2(MoO_4)_3$ anneled at 120°C (a); 300 °C (b) 500 °C (c) 700 °C (d) and 1000 °C (e)