Contribution ID: **17** Type: **Oral Presentation**

Effects of annealing time on the structure and photoluminescence properties of Sr3Al2O6:1% Ce3+ nanophosphor synthesize via sol-gel method

Tuesday, 26 June 2018 12:40 (20 minutes)

Sr3Al2O6:1% Ce3+ nano-powders have been successfully prepared via sol-gel technique. Citric acid was used as a chelating agent. All powder samples were annealed at 950 oC and the annealing time (AT) was varied from 0.5 - 20 hrs. X-ray diffraction (XRD), scanning electron microscopy (SEM) coupled with an energy dispersive X-ray spectroscope (EDS), transmission electron microscopy (TEM) and photoluminescence (PL) spectra were used to characterize the samples. The XRD data revealed that all the samples were single phase crystalline structures and the estimated average crystallites size were found to be 20 nm. EDS results confirmed the presence of the expected elementary composition. SEM image presented in Fig. 1 (a) illustrates that the crystals have rods-like morphology structures. The AT was found to influences the phosphor morphology. The TEM results confirmed that the prepared nano-powders are on the nano-scale. PL results showed that the excitation wavelength as a function of emission intensity has the Gaussian behaviour with the maximum at 263 nm. When the samples were excited at 263 nm, four emission peaks at 382, 541, 593 and 620 nm were observed (see Fig. 1 (b)). All of the emissions corresponds to the emissions observed on the un-doped (Sr3Al2O6), which suggest that all of the observed emissions are originating from the defects levels within the Sr3Al2O6 (host) [1,2]. The optimum luminescence for 541 nm emission was found to be for the AT = 8 hrs sample.

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Session Classification: Physics of Condensed Matter and Materials

Track Classification: Track A - Physics of Condensed Matter and Materials