

## Synthesis, Microstructure and Photoluminescence Properties of Yttrium Orthovanadates: Influences of Silica Nano-Particles and Nano-Layers

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**Abstract :** In this investigation, firstly  $\text{Eu}^{3+}$  doped  $\text{YVO}_4$  phosphor was synthesized using solid-state method. Then silica was coated on the surface of particles via sol-gel method. To study the influence of  $\text{SiO}_2$  addition on microstructure and photoluminescence characteristics of  $\text{YVO}_4:4\% \text{Eu}^{3+}$  phosphor materials, we employed X-ray Diffraction (XRD), Field Emission Scanning Electron Microscope (FESEM), High-Resolution Transmitted Electron Microscope (HRTEM), Focused Ion Beam (FIB), Brunauer Emmett Teller (BET), Inductively coupled plasma (ICP), Electron Spin Resonance (ESR) and Photoluminescence (PL) equipments. The XPS characterization confirmed the formation of Y-O-Si and V-O-Si bondings between  $\text{YVO}_4:\text{Eu}^{3+}$  phosphor particle and  $\text{SiO}_2$  coating. In addition, it was found that although the amounts of added  $\text{SiO}_2$  were not remarkable, but it resulted in enhancement of emission intensity of the phosphors. Finally by employing ESR analysis, it was shown that surface oxygen vacancies, result in reduction of  $\text{V}^{5+}$  to the lower valence state of  $\text{V}^{4+}$ .

**Keywords :** solid state, sol-gel, silica, coating, photoluminescence

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