red-emitting $Sr_7Sb_2O_{12}:Eu^{3+}$, M^+ (M=Li, Na, K) phosphor for warm white LED: synthesis, optical properties, and LED fabrication

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二.成果简介：

The phase structure, crystal morphology, luminescence properties, luminescence decay lifetime, thermal stability and chromaticity coordinate of the as-synthesized phosphors of $Sr_7Sb_2O_{12}:Eu^{3+}$ were investigated in detail. It could be effciently excited by the near-ultraviolet (UV) light and exhibited bright red emission around 612 nm. When co-doped with the charge compensation M+ (M =Li, Na, K) ions, theemission intensity of Eu^{3+} can be enhanced. The temperature-dependent spectra of $Sr_7Sb_2O_{12}:Eu^{3+}$ implied that this sample shows good thermal-stable properties. The decay lifetime of $Sr_7Sb_2O_{12}:0.20Eu^{3+}$ was about 1.44 ms, and the WLED was fabricated.

三. 主要研究内容及创新点：

Novel red phosphors $Sr_7Sb_2O_{12}:Eu^{3+}$ and $Sr_7Sb_2O_{12}:Eu^{3+}$, M^+ (M = Li, Na, K) have been synthesized through high-temperature solid-state method. XRD patterns results indicate that the as-prepared samples are pure phase. It emitted pure red light when excited by near-UV LED chips, and adding the compensator ions M^+ (M=Li, Na, K) into $Sr_7Sb_2O_{12}:Eu^{3+}$ can enhance the emission intensity of Eu^{3+}, resulting from quenching the vacancy defect. The decay lifetimes of $Sr_7Sb_2O_{12}:Eu^{3+}$ were in the range of several microseconds and decreased with increasing dopant content. Thermal stability studies disclosed that the $Sr_7Sb_2O_{12}:Eu^{3+}$ phosphors showed excellent thermal stability. White LED fabricated by combining with $Sr_7Sb_2O_{12}:0.20Eu^{3+}$ phosphor, $BaMgAl_{10}O_{17}:Eu^{2+}$ phosphor, $(Ba,Sr)_2SiO_4:Eu^{2+}$ phosphor and near-UV chip has high CRI (Ra=91.8) and low CCT (4260 K). Therefore, it can be concluded that the potential application in warm white LED under near-UV light excitation.

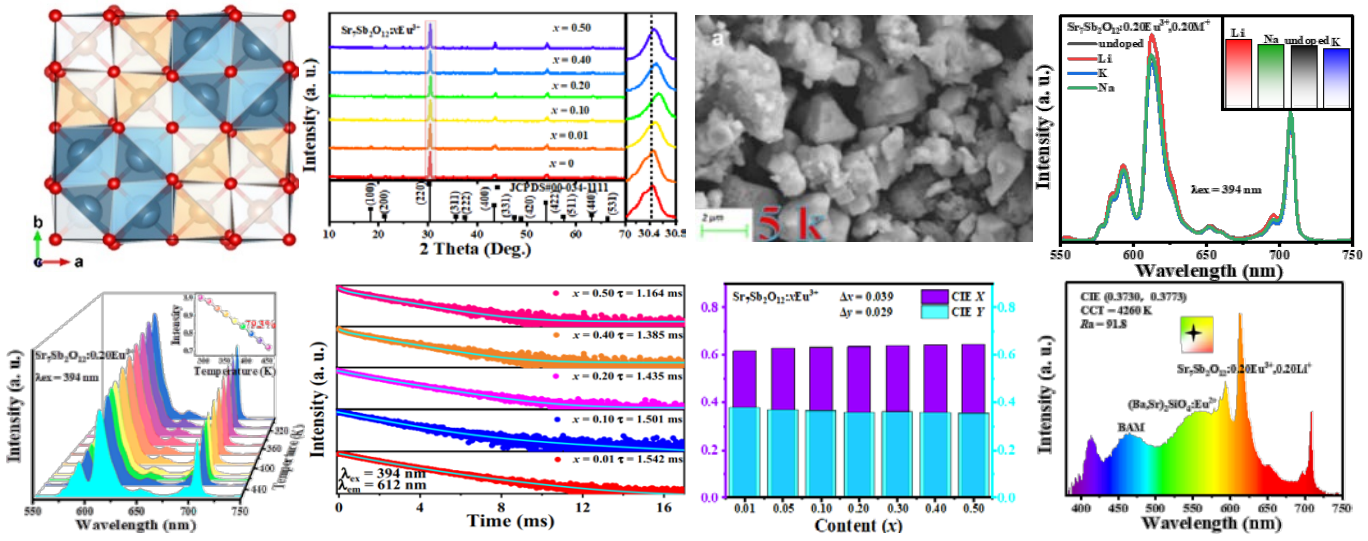


图 晶体结构、物相形貌、变温光谱、荧光寿命及 WLED 器件制备

四. 主要研究成果及应用情况

论文：A novel red-emitting $Sr_7Sb_2O_{12}:Eu^{3+}$, M^+ (M=Li, Na, K) phosphor for warm white LED: synthesis, optical properties, and LED fabrication[J]. Applied physics A. 2022.06.

专利：Eu^{3+}掺杂的复合锑酸盐红色荧光粉及其制备方法和应用，专利号：CN202110826336.9，2021.11.

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