Photoluminescence of Li^+ and Eu^{3+} co-doped NaLa $(WO_4)_2$ as near-UV excited red phosphors

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A series of Li^+ and Eu^{3+} co-doped double tungstate $NaLa(WO_4)_2$ (NLW) red phosphors have been successfully synthesized by an hydrothermal assisted ion exchange method. The effects of Li^+ doping concentration on the crystal structure, morphology and photoluminescence properties were investigated by using XRD, TEM and photoluminescence (PL) measurement. The results reveal that the samples have phase-pure scheelite structure and adopt spherical particle morphology. A certain concentration of Eu^{3+} and Li^+ ions can be availably doped into the crystal lattice of $NaLa(WO_4)_2$ and did not change the scheelite structure. Room temperature photoluminescence spectrum showed that these phosphors can be excited effectively by a near UV light of 396 nm leading to bright emission characteristic red (613 nm) spectrum. The emission brightness and the excitation under near-UV light illumination were obviously enhanced after the doping of Li^+. Furthermore, the optical brightness is highly dependent on the concentration of doping Li^+ which is determined by ion exchange duration and the precursor concentration of $LiNO_3$. As 5% Li^+ ions was introduced into the crystal lattice, the emission intensity was enhanced by more than 10-fold as compared with the pristine one. Thus, the prepared Li^+ and Eu^{3+} co-doped NaLa $(WO_4)_2$ is kind of very promising red phosphors that are suitable for application in near-UV type LEDs.

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