

Eu<sup>3+</sup>掺杂硼酸银玻璃制备、表征及其在白光发光二极管中的应用

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Preparation and characterization of Eu<sup>3+</sup> doped silver borate glasses and their applications in white light emitting diodes

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## 摘要

研究了采用玻璃荧光体实现白光发光二极管(LED)的可能性。采用熔融淬火技术制备了一系列Eu<sup>3+</sup>掺杂的含不同比例银成分的硼酸银玻璃,并对玻璃的结构、光谱及色度学性质进行了研究。X射线衍射测量证明在其能分辨的水平上样品中没有银粒子存在,而吸收光谱测量观察到了高含量银成分的样品中含有银纳米颗粒;样品的激发和发射光谱测量表明近紫外光可有效激发样品并产生覆盖几乎全部可见波段的发射;荧光衰减测量表明样品中含有多种Ag聚集发光中心。计算了样品的发射色坐标,结果显示一定组分的Eu<sup>3+</sup>掺杂硼酸银可实现色坐标为(0.312,0.336),显色指数为88的白光发射。最后,利用390 nm发射半导体二极管和30 mol % AgNO<sub>3</sub>的玻璃样品成功制作了白光发射器件。

**关键词** : 硼酸银玻璃, Eu<sup>3+</sup>掺杂, Ag聚集, 白光发光二极管(LED)

## Abstract :

The feasibility to produce white light emitting diodes by using glass phosphors was explored, and a series of Eu<sup>3+</sup> doped silver borate glasses with various silver contents were prepared via a melt-quenching technique. The structural, spectral and chromatic properties of the glasses were studied. X-ray diffraction (XRD) patterns indicate that there are no silver particles in glasses in the identifiable level that the XRD could reach, but absorption spectra exhibit the existence of silver nanoparticles in the glasses with higher silver contents. Furthermore, the excitation and emission spectra show that the glass samples can be effectively excited by near ultraviolet and can generate emissions covering almost full visible region. Fluorescence decays demonstrate that there are many types of silver aggregates in the glass samples. The color coordinate was calculated, and it shows that white light generation can be obtained from Eu<sup>3+</sup> doped silver borate glass samples with certain composition. Finally, a white emitting device was produced by using the glass with the color coordinate of (0.312,0.336) and a color rendering index of 0.88 and a 390 nm diode.

**Key words** : silver borate glass Eu<sup>3+</sup> doping Ag aggregation white Light Emitting Diode(LED)

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