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### 材料合成及性能

用于白光LED的规则球形YAG:Ce<sup>3+</sup>荧光粉制备及封装性能研究

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摘要：采用高温固相法和筛分法合成了YAG:Ce<sup>3+</sup>系列黄色荧光粉。采用X射线衍射仪(XRD)、电子扫描显微镜(SEM)、激光粒度分布仪及荧光分光光度计对所制备样品进行了表征。结果表明：所得3种样品形貌规则成球形，粒度分布集中，其中心粒径(D50)分别为29.59, 17.40, 9.56 μm, 粒径分布离散度分别为0.85, 0.80和0.87。通过Reitveld精修拟合发现，随着荧光粉粒径大小的变化，基质的晶格常数并未发生明显变化。随着中心粒径(D50)逐渐变小，其荧光发射强度逐渐降低，且发生明显的蓝移，同时对蓝光的吸收逐渐减弱。通过对荧光粉与蓝光芯片配合所得白光LED的发光效率、显色指数及色温进行测试发现，当使用相同粉胶比浓度、相同点胶量时，随着荧光粉粒径的减小，所得白光LED的流明效率从109.95 lm/W降低到了99.85 lm/W，而显色指数和色温同时升高。

关键词：荧光粉 光学性能 粒径 白光LED

### Synthesis and Packaging Performance of Regular Spherical YAG:Ce<sup>3+</sup> Phosphors for White LEDs

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Abstract: YAG:Ce<sup>3+</sup> phosphors with regular spherical morphology and different particle size distribution were successfully prepared by solid-state reaction followed by sieving method. XRD analysis revealed that crystal lattice parameters nearly unchanged with the variation of particle size. The effect of particle size distribution on optical properties was investigated by spectrophotometer. The results indicated that the absorption of blue light and emission intensity of phosphors simultaneously decreased with decreasing of particle size. Meanwhile, the maximum emission wavelength showed blue shift and chromaticity shifted toward green region with smaller particle size. The packaging performance suggested that the reduction in particle size will result in reduction of luminous efficiency. In contrast, the colour temperature ( $T_c$ ) and general colour rendering index (Ra) increased with decreasing of particle size.

Keywords: phosphors optical properties particle size white LEDs

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