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器件物理及器件制备技术

AlGaInP-LED微阵列单元侧反射对出光效率的影响

包兴臻^{1,2}, 梁静秋¹, 梁中翥¹, 田超^{1,2}, 秦余欣¹, 王维彪¹

1. 中国科学院 长春光学精密机械与物理研究所 应用光学国家重点实验室, 吉林 长春 130033;
2. 中国科学院大学, 北京 100049

摘要: LED微阵列器件具有体积小、分辨率高、寿命长及耗能低等突出特点。出光效率是该器件的一项重要参数,文中对以AlGaInP外延片为基片的LED微阵列器件的出光效率进行了理论及实验研究。器件的像素周期设计为 $100\ \mu\text{m}\times 100\ \mu\text{m}$,发光单元间的上隔离沟槽宽度为 $20\ \mu\text{m}$ 、深度为 $25\ \mu\text{m}$,将在 $600\sim 650\ \text{nm}$ 波段具有高反射率的均匀掺单晶硅纳米颗粒的聚酰亚胺作为复合材料来填充上隔离沟槽,将侧面出射的光反射到上表面,实现了相邻两个发光单元之间的光学和电学隔离。分析计算表明,通过填充硅纳米颗粒/聚酰亚胺复合膜材料,使每个发光单元侧面出射光的16.695%反射回窗口层,提高了出光效率。这项研究将有助于提高LED微阵列器件的出光效率。

关键词: 聚酰亚胺复合膜 出光效率 反射率 微阵列

Effect of AlGaInP-LED Arrays Units Side-Reflection on Light Output Efficiency

BAO Xing-zhen^{1,2}, LIANG Jing-qiu¹, LIANG Zhong-zhu¹, TIAN Chao^{1,2}, QING Yu-xin¹, WANG Wei-biao¹

1. State Key Laboratory of Applied Optics, Changchun Institute of Optics, Fine Mechanics and Physics, Chinese Academy of Sciences, Changchun 130033, China;
2. University of Chinese Academy of Sciences, Beijing 100049, China

Abstract: LED micro-arrays apparatus has many outstanding characteristics, such as small bulk, high resolving power, long life, low wear out power and so on. Lighting output efficiency is an important parameter. The text made theoretic and experiment study for LED micro-arrays apparatus on AlGaInP wafer. The arrays apparatus image sizes is $100\ \mu\text{m}\times 100\ \mu\text{m}$. Etching upper isolating groove with the deep width ratio was $25\ \mu\text{m}:20\ \mu\text{m}$ between adjacent light-emitting unit. Then filling the groove with mixed Si granule that has high reflect to $600\sim 650\ \text{nm}$ wave band into polyurethane. This hybrid materials can reflect lateral light to above surface, not only improve light efficiency of micro arrays apparatus, but also realize light and electric seclusion of two adjacent light-emitting unit. Theoretical calculation indicate that the multiple film can reflect each light-emitting unit the light of side-wall 16.695% to window layer, it improves lighting output efficiency availably. The study administers to the improvement of lighting output efficiency for LED micro-arrays apparatus.

Keywords: polyimide composite film light output efficiency reflectivity micro-arrays

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通讯作者: 王维彪, E-mail: wangwbt@126.com

作者简介: 包兴臻(1987-),男,甘肃庆阳人,硕士研究生,主要从事微型LED阵列器件的制作研究。

作者Email: wangwbt@126.com

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