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### 器件制备及器件物理

具有电流阻挡层的不同GaN基LED的光电特性

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摘要： 研究对比了InGaN/GaN多量子阱发光二极管中p电极下的不同SiO<sub>2</sub>电流阻挡层的光电特性。6种样品被分为3组：普通表面、表面粗化、表面粗化+边墙腐蚀。每组都有两种结构，一种具有电流阻挡层，另一种没有电流阻挡层。每组中，具有电流阻挡层的LED在20 mA下的正向电压分别为3.156, 3.282, 3.284 V，略高于不含电流阻挡层的样品(V<sub>f</sub>=3.105, 3.205, 3.210 V)。但是，具有电流阻挡层的LED的光效和光功率要优于无电流阻挡层的器件，在20 mA下的光功率分别提高了10.20%、12.19%和11.49%。这些性能的提升都要归功于电流阻挡层良好的电流扩展效应，同时电流阻挡层还可以减小p电极下的寄生光吸收。

关键词： LED 电流阻挡层 光功率 光效

### Electrical and Optical Characteristics of Different GaN-based Light Emitting Diodes with Current Blocking Layer

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Abstract: InGaN/GaN multiple-quantum well (MQW) light-emitting diodes (LEDs) were fabricated, in which a SiO<sub>2</sub> current blocking layer (CBL) was inserted underneath the p-pad electrode. Samples were divided into three groups: normal surface, surface roughing, and surface roughing plus side wall etching. Each group had two different structure devices: with and without CBL. In each group, the voltage V<sub>f</sub> at 20 mA for the LEDs with a CBL (V<sub>f</sub>=3.156, 3.282, 3.284 V) were slightly higher than those of without CBL (V<sub>f</sub>=3.105, 3.205, 3.210 V). However, the luminous efficiency and the light-output power of the LEDs with CBL were better than those without CBL. At 20 mA current, the output power of the LEDs with a CBL increase 10.20%, 12.19%, 11.49% compared with those without CBL. It is due to the current spreading effect in CBL devices. The CBL can also reduce parasitic optical absorption in the p-pad electrode.

Keywords: LED CBL light-output power luminous efficiency

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