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材料合成及性能

非对称ZnO/ZnMgO双量子阱内量子效率的提高

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摘要： 在c-plane面蓝宝石衬底上生长了ZnO/Zn_{0.85}Mg_{0.15}O非对称双量子阱,其内量子效率相对于对称量子阱有了显著的提高。ZnO/Zn_{0.85}Mg_{0.15}O的10周期对称量子阱和5周期非对称双量子阱都是利用等离子体辅助分子束外延技术制备的。ZnO/Zn_{0.85}Mg_{0.15}O非对称双量子阱的内量子效率提高至对称阱的1.56倍。时间分辨光谱和光致发光光谱测试结果证实,在ZnO/Zn_{0.85}Mg_{0.15}O非对称双量子阱中存在从窄阱到宽阱的激子隧穿过程,这是内量子效率提高的主要原因。

关键词： ZnO 量子阱 激子隧穿 内量子效率

Improvement of Internal Quantum Efficiency of Asymmetric ZnO/ZnMgO Multi-quantum Wells

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Abstract: We report a dramatic increase in the internal quantum efficiency (IQE) of ZnO/ZnMgO multi-quantum wells (MQWs) fabricated on c-plane sapphire substrate by introducing asymmetric double-quantum-well (ADQW) structure. A marked enhancement in efficiency, by as much as 1.56 times, was observed for the ten-period symmetrical MQWs with asymmetric structure. The effects of excitons tunneling from the narrow well to the wide well, which was proved by photoluminescence spectra and time-resolved photoluminescence spectroscopy, can influence the IQE.

Keywords: ZnO quantum wells excitons tunneling internal quantum efficiency

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