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论文

从晶体取向特点探讨ZnO薄膜的晶体不完整性

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摘要:

用MOCVD法在蓝宝石衬底上得到了ZnO(0002)膜, 并用XRD和SEM进行了表征. 结果表明, 薄膜中沿［0001］择优取向生长的柱状晶垂直于衬底表面, 晶柱之间存在着边界和间隙. X射线Φ扫描实验结果表明, 晶柱之间的取向偏差在3°~30°之间. X射线ω摇摆曲线和谱线宽度分析结果表明, 薄膜中的晶柱是由多个晶粒堆叠而成, 且晶粒之间的平均取向偏差也在2.6°以上. 实验结果表明, ZnO大失配度异质外延膜是c轴［0001］取向柱状多晶体, ZnO薄膜的结晶不完整性主要是由其柱状晶结构造成的.

关键词: 氧化锌薄膜; 晶体取向; 取向柱状多晶体

Studies on Crystal Structure of ZnO Films by the Mis-orientation

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Abstract:

ZnO(0002) films were grown on sapphire(0006) substrate by metal-organic chemical vapor deposition (MOCVD) and were characterized by X ray diffraction(XRD) and scanning electronic microscope(SEM). SEM and XRD results show that the columnar crystals grew along c axis and were vertical to the(0006) plane of the substrate. There exist grain boundaries and grain interstitials among the crystals. The Φ scanning curves of the(10-13) plane for ZnO films show that the mis orientation among columnar crystals ranged from 3° to 30°. The full wide at half maximum(FWHM) of rocking curves of(0002) plane for the ZnO films is above 2.6°. Grain sizes at different thicknesses illustrate that the column is composed of the grains with different sizes. The big mismatch heteroepilayer ZnO films are columnar poly crystals orienting along c axis.

Keywords: ZnO films; Crystal orientation; Columnar poly-crystals

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