

退火对立方相  $Mg_xZn_{1-x}O$  薄膜的结构和光学性质影响

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摘要 在蓝宝石(0001)衬底上低温生长立方相  $Mg_xZn_{1-x}O(x>0.5)$  晶体薄膜, 用X射线衍射(XRD)

和透射光谱分析高温退火对薄膜的结构和光学性质的影响. 结果表明: 对  $Mg_{0.53}Zn_{0.47}O$  薄膜, 在  $900^\circ C$  的退火温度下, (0002)

衍射峰以及透射光谱上双吸收边的出现均表明有六方结构从其立方结构中分离出来; 但对于Mg含量高于55%的样品, 即使经历了  $1000^\circ C$  的高温退火, 也不会有任何相分裂现象出现. 而电学测试结果表明,

高温下热稳定性良好的立方相  $Mg_{0.55}Zn_{0.45}O$  晶体薄膜还能用于金属-绝缘体-半导体的绝缘层, 并且漏电流小.

由此可以判断,  $x \geq 0.55$  的超饱和  $Mg_xZn_{1-x}O$  薄膜具有稳定的立方相晶体结构和优良的光学、电学性质,

因而是制作高质量的光电子器件和量子阱激光器的理想材料.

关键词 [立方相  \$MgxZn1-xO\$  薄膜](#) [退火](#) [晶体结构](#) [光学性质](#) [电学性质](#)

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## Effects of Post-annealing Treatment on the Structural and Optical Properties of Cubic $Mg_xZn_{1-x}O$ Thin Films Grown on Sapphire

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**Abstract** Single cubic-phase  $Mg_xZn_{1-x}O(x>0.5)$  alloy films were synthesized on c-plane sapphire substrates by low temperature physical deposition. The effects of the post-annealing treatment on the structural properties of the films were investigated by the measurements of XRD and transmission spectra. Hexagonal-phase (wurtzite)  $MgZnO$  was observed segregating from the cubic-phase  $Mg_{0.53}Zn_{0.47}O$  film after annealing at  $900^\circ C$ , while no secondary phase was seen in the samples with Mg fraction exceeding 0.55. Electrical measurement indicates that cubic-phase  $Mg_{0.55}Zn_{0.45}O$  films can be used in metal-insulator-silicon (MIS) structures as insulators with low leakage current densities. It could be concluded that the cubic-phase  $Mg_xZn_{1-x}O$  films with x exceeding 0.55 are stable enough to be applied in fabricating high quality optoelectronic devices.

**Key words** [cubic  \$MgxZn1-xO\$  films](#) [anneal](#) [crystal structure](#) [optical property](#) [electrical property](#)

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