

[101]取向Li掺杂ZnO薄膜光学性能的研究

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摘要 采用射频磁控溅射法在玻璃衬底上制备了[101]取向的Li:ZnO薄膜, 研究了该薄膜的光学性能随热处理温度变化的规律. 结果表明, 399nm的发光峰是由Li的杂质能级引起; 与[002]取向的薄膜相比, 未经热处理的[101]薄膜其光学带隙大, 且出现了380nm附近的带边发射(NBE)峰; 在560~580℃热处理下, 其晶胞变小、光学带隙变窄、360nm左右的带间发光峰红移; 当热处理温度升至610℃时, 薄膜中再次出现380nm的NBE峰.

关键词 [ZnO薄膜](#) [Li掺杂](#) [\[101\]取向](#) [PL谱](#)

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Optical Properties of Li:ZnO Thin Films with [101] Orientation

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Abstract [101] oriented Li:ZnO thin films were prepared on limeglass substrates by using a r.f. magnetron sputtering method. The effect of annealing temperature on the optical properties of Li:ZnO thin films was investigated. Comparing with [002] oriented Li:ZnO film, the as-deposited [101] oriented film has wide band gap (E_g), though it red-shifts from 3.37 to 3.29 eV after annealing at 560-580℃, accompanying with the shrinkage of unit cell. When the [101] oriented Li:ZnO film is annealed at high temperature (610℃), its band gap shifts back to 3.35eV. The photoluminescence (PL) studies confirm that there exhibit 399nm, 421nm and 468nm PL peaks for all the films. However, when the films are annealed at 560--580℃, the near-band-edge (NBE) emission peak at 380nm of the samples disappears and the band-to-band UV emission near 360nm slightly shifts to large wavelength due to the decrease of E_g . It is considered that the PL peak of 399nm is induced by Li dopant and the other peaks are arisen from the intrinsic defects in ZnO lattice structure. The effects of Li dopant on the structural and optical characteristics were also discussed.

Key words [ZnO thin film](#) [Li dopant](#) [\[101\] orientation](#) [photoluminescence](#)

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