



发光学应用及交叉前沿

退火温度对溶胶-凝胶法制备锌锡氧化物薄膜晶体管的影响

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摘要：采用溶胶-凝胶法制备了非晶锌锡氧化物(ZTO)薄膜晶体管(TFT),通过热重-差热分析(TG-DTA)对ZTO胶体中的化学反应进行了分析,研究了不同退火温度对ZTO TFTs性能的影响。结果表明:当退火温度在300~500℃范围内时,薄膜为非晶态结构,薄膜表面致密、平整。当退火温度达到400℃时,薄膜在可见光范围内具有高透率(>85%)。随着退火温度的升高,器件阈值电压明显降低,由15.85 V降至3.76 V,载流子迁移率由 $0.004 \text{ cm}^2 \cdot \text{V}^{-1} \cdot \text{s}^{-1}$ 提高到 $5.16 \text{ cm}^2 \cdot \text{V}^{-1} \cdot \text{s}^{-1}$,开关电流比达到 10^5 。退火温度的升高明显改善了ZTO TFT的电学性能。

关键词：溶胶-凝胶法 退火温度 薄膜晶体管 电学性能

Influence of Annealing Temperature on Zinc-Tin-Oxide Thin Film Transistors Prepared by Sol-gel Method

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Abstract: Zinc-tin-oxide (ZTO) thin film transistors (TFTs) were fabricated by sol-gel method. Thermogravimetric and differential thermal analyses (TG-DTAs) were performed to investigate the chemical reactivity in the ZTO solutions. The effects of annealing temperatures on characteristics of ZTO-TFTs were investigated in this paper. With the increasing of annealing temperatures, all samples are amorphous, and surface is uniform. The ZTO thin films annealed at 400°C and 500°C are highly transparent (>85%) in the visible region. When the annealing temperature increased from 300°C to 500°C, the threshold voltage of solution-processed ZTO TFTs decreased from 15.85 V to 3.76 V, and the saturation mobility increased from $0.004 \text{ cm}^2 \cdot \text{V}^{-1} \cdot \text{s}^{-1}$ to $5.16 \text{ cm}^2 \cdot \text{V}^{-1} \cdot \text{s}^{-1}$. I_{on}/I_{off} current ratio of 10^5 was obtained at 500°C.

Keywords: sol-gel annealing temperature thin film transistors electrical characteristics

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