

用于非制冷热释电红外探测器的 PZT 铁电薄膜研究

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摘要

采用溶胶-凝胶和射频磁控溅射相结合的方法制备了 PZT 铁电薄膜. 用溶胶-凝胶法制备一层 PZT 薄膜作为籽晶层, 在衬底 PZT(seed layer)/Pt/Ti/SiO₂/Si 上用射频磁控溅射过量 10% Pb 的 Pb(Zr_xTi_{1-x})O₃(x=0.3) 陶瓷靶生长厚 500nm 的 PZT 铁电薄膜. 采用在 450℃ 预退火, 575℃ 后退火的快速分级退火方法对 PZT 铁电薄膜进行热处理. PZT 铁电薄膜获得了较好的热释电性能, 热释电系数、介电常数、介电损耗和探测度优值因子分别为 $\rho=2.3 \times 10^{-8} \text{C} \cdot \text{cm}^{-2} \cdot \text{K}^{-1}$, $\varepsilon=500$, $\tan\delta=0.02$, $F_d=0.94 \times 10^{-5} \text{Pa}^{-0.5}$.

关键词 [非制冷热释电红外探测器](#) [PZT](#) [籽晶层](#) [快速分级退火](#)

分类号 [TN304](#), [TB43](#)

PZT Ferroelectric Thin Film for Uncooled Pyroelectric Infrared Detectors

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Abstract

Lead zirconate titanate(PZT) ferroelectric thin films were prepared by both sol-gel and r.f. magnetron sputtering technologies. In order to decrease the crystallization temperature of thin films and improve the probabilities of nucleus, a PZT seed-layer was prepared by using the sol-gel method. The PZT ferroelectric thin films with about 500nm thickness were sputter-deposited from a Pb(Zr_xTi_{1-x})O₃(x=0.3) ceramic target containing 10% excess Pb on PZT(seed layer)/Pt/Ti/SiO₂/Si substrates. The stepping-annealing with RTP (rapid thermal process) was proposed for thermal treatment of the PZT ferroelectric thin films. The PZT ferroelectric thin film showed good dielectric and pyroelectric properties by pre-annealing at 450℃ for 5min and following post-annealing at 575℃ for 5min. The results of pyroelectric coefficient $2.3 \times 10^{-8} \text{C} \cdot \text{cm}^{-2} \cdot \text{K}^{-1}$, relative dielectric constant 500, dielectric loss 0.02, detectivity figure of merit $0.94 \times 10^{-5} \text{Pa}^{-0.5}$ were obtained.

Key words [uncooled pyroelectric infrared detectors](#) [lead zirconate titanate\(PZT\)](#) [seed layer](#) [rapid stepping-annealing](#)

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