

Excimer laser crystallized (Pb,La)(Zr,Ti)O₃ thin films

Author(s): Bharadwaja SSN (Bharadwaja, S. S. N.)¹, Dechakupt T (Dechakupt, T.)¹, Trolier-McKinstry S (Trolier-McKinstry, S.)¹, Beratan H (Beratan, H.)²

Addresses:

1. Penn State Univ, Mat Res Inst, University Pk, PA 16802 USA
2. L 3 Commun IP, Dallas, TX USA

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Abstract: A KrF pulsed excimer laser (248 nm) was utilized to crystallize sputtered La-modified Pb(Zr,Ti)O₃ (3:30:70) (PLZT) films on LaNiO₃-coated silicon substrates. The film surface was irradiated with defocused laser pulses in an oxygen ambient at various substrate temperatures. Polycrystalline, phase pure perovskite PLZT thin films were produced for substrate temperatures of 250°C and higher. The dielectric constant and loss tangent values of laser-assisted crystallized (10 min exposure at 10 Hz using a substrate temperature of 400°C) PLZT thin films at 10 kHz were 406 and 0.027; in comparison, rapid thermal annealed films (annealed at 700°C for 1 min) showed values of 400 and 0.021, respectively. Laser crystallized films exhibited a remanent polarization value of 14 μC/cm² with a coercive field $|(E_{+c}+E_{-c})|/2$ of 95 kV/cm.