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Electrical/Optical Characterization of PZT Thin Films Deposited through Sol-Gel Processing

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PZT (Pb(Zr,Ti)O3) thin films have been used widely in the MEMS application, due to their inherent ferroelectric and piezoelectric properties. Such ferroelectricity induces much higher dielectric constants compared to those of the nonperovskite materials. In this work, the PZT thin films were deposited onto Indium-Tin-oxide (ITO) substrates through the spin-coating of PZT sols. The deposited PZT thin films were characterized in terms of the electrical and optical properties with special emphases on conductivity and optical constants. The detailed analysis techniques incorporate the dc-based current-voltage characteristics for the electrical properties, spectroscopic ellipsometry for optical characterization, atomic force microscopy for surface morphology, X-ray Photoelectron Spectroscopy for chemical bonding, Energy-dispersive X-ray Spectrometry for chemical analyses and X-ray diffraction for crystallinity. The ferroelectric phenomena were confirmed using capacitance-voltage measurements. The integrated physical/chemical features are attempted towards energy-oriented applications applicable to next-generation high-efficiency power generation systems.

Keywords: PZT, (Pb(Zr,Ti)O3), Sol-Gel Process