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The roles of solution chemistry, substrate, and pyrolysis temperature on the chemical heterogeneity in PZT films

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Recent investigations have revealed that $Pb(Zr,Ti)O_3$ films prepared via an inverted mixing order (IMO) chelate chemistry on $Pt/ZnO/SiO_2/Si$ substrates possess improved ferroelectric and dielectric responses and that these responses were due to improved chemical homogeneity compared to those prepared on conventional $Pt/Ti/SiO_2/Si$ substrates. In this presentation we have investigated the roles of solution chemistry, substrate metallization stack, and pyrolysis temperature on chemical homogeneity and the resulting properties. We will show that films prepared from traditional sol-gel chemistries possess chemical gradients regardless of substrate metallization stack and pyrolysis temperature. Films prepared from IMO chemistries do not possess chemical gradients when prepared on substrates devoid of titanium adhesion layers, but do possess gradients when a titanium adhesion layer is used. The resulting film crystallographic textures and ferroelectric properties will also be discussed. Sandia is a multiprogram laboratory operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Company, for the United States Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

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