

# Management of Lead Content for Growth of {001}-Oriented Lead Magnesium Niobate-Lead Titanate Thin Films

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A scalable growth process for domain engineered {001}-oriented lead magnesium niobate—lead titanate (PMN-PT) thin films with Lotgering factors of 0.98–1.0, without an orienting perovskite seed layer, is presented. Deposition of a 2–3-nm-thick PbO buffer layer on {111} Pt thin film bottom electrodes, prior to chemical solution deposition of PMN-PT reduces the driving force for Pb diffusion from the PMN-PT to the bottom electrode, and facilitates nucleation of {001}-oriented perovskite grains. Energy dispersive spectroscopy demonstrated that up to 10% of the Pb from a PMN-PT precursor solution may diffuse into the bottom electrode. PMN-PT grains with a mixed {101}/{111} orientation in a matrix of Pb-deficient pyrochlore phase were then promoted near the interface. When this is prevented, phase-pure films with {001} orientation can be achieved.