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ABSTRACT

A modified PbZrTiO_3 perovskite crystal material thin film (16), wherein the PbZrTiO_3 perovskite crystal material includes crystal lattice A-sites and B-sites at least one of which is modified by the presence of a substituent selected from the group consisting of (i) A-site substituents consisting of Sr, Ca, Ba and Mg, and (ii) B-site substituents selected from the group consisting of Nb and Ta. The perovskite crystal thin film material may be formed by liquid delivery MOCVD from metalorganic precursors of the metal components of the thin film, to form PZT and PSZT, and other piezoelectric and ferroelectric thin film materials. The thin films of the invention have utility in non-volatile ferroelectric memory devices (NV-FeRAMs), and in microelectromechanical systems (MEMS) as sensor and/or actuator elements, e.g., high speed digital system actuators (10) requiring low input power levels.