Combinatorial approach for ferroelectric material libraries prepared by liquid source misted chemical deposition method

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Combinatorial approach for novel functional materials in the huge diversity of chemical composition and processing conditions has become more important for breakthrough in thin film electronic and energy-conversion devices. The efficiency of combinatorial method depends on the preparation of a reliable high-density composition thin-film library. Liquid source misted chemical deposition (LSMCD) is a cheap promising combinatorial screening tool. It can control the composition up to ppm level and produce homogeneous multicomponent library. We developed LSMCD method and demonstrated its validity in screening the chemical composition of $Bi_{3.75}La_xCe_{0.25-x}Ti_3O_{12}$ (BLCT) for high remanent polarization (P_r). LSMCD method allows us to prepare BLCT thin-film library at the variation of 0.4 mol% of La. Maximum $2P_r$ is 35 $\mu C/cm^2$ at x = 0.21. The intensity of (117) XRD peak is quantitatively related to $2P_r$. Newly developed scanning piezoelectric deformation measurement for nano-sized samples using SPM is also found out to be reliable for determining the relative ranking of P_r value rapidly.