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Strain-modulated Self-Assembly of Nanostructures within Epitaxial Thin-films via Pulsed Laser Ablation AMIT GOYAL, SUNG-HUN WEE, YANFEI GAO, CLAUDIA CANTONI, KARREN MORE, YURI ZUEV, JUNSOO SHIN, ORNL — Nanocomposites comprising three-dimensionally (3D) ordered arrays of nanodots of one type of complex ceramic material embedded in another complex ceramic material are expected to exhibit novel physical properties, tunable by adjusting the overall composition, concentration, feature size and spatial ordering of the nanodots. Applications of such nanocomposites in the areas of multiferroics, photovoltaics, solid state lighting, ultra-high density storage and high temperature (high-Tc) superconductivity are of interest. A joint experimental, theoretical and computational study on achieving ordering via 3D self-assembly of nanodots of one complex ceramic material within another complex ceramic material, such as 3D self-assembly of insulating BaZrO3 (BZO) nanodots within high-Tc superconducting YBCO films, was performed. Vertically or horizontally ordered arrays (or simultaneous ordering in both directions) of BZO nanodots within superconducting films have been made possible via strain modulation between nanodots. Experimental results obtained for novel nanocomposites for other applications involving perovskite-spinel mixtures such as CoFe2O4-BaTiO3, CoFe2O4-BiFeO3, etc. will also be presented. Such materials with "controlled self-assembly" of nanostructures should find application in many areas.

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