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Giant electrocaloric effect in compositionally graded PZT multilayer thin films

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Abstract: The multiphase coexisting of compositionally graded $PbZr_xTi_{1-x}O_3$ multilayer thin films were fabricated using sol-gel method. The giant electrocaloric effect (ECE) has been obtained through regulating the growth sequence of the multilayer thin films. At room temperature (at 298 K), ΔT values of up graded multilayer and down multilayer thin films are 9.1 K (applied electric field E = 755 kV/cm) and 7.3 K (E = 930 kV/cm), respectively. In addition, both of the films exhibit outstanding ECE at higher temperature, ΔT values of 17.9 K (at 453 K) and 26.8 K (at 393 K) are also obtained for up graded multilayer and down multilayer thin films. The results indicate that the compositionally graded multilayer thin films with a giant ECE could be a potential candidate for the application in cooling devices.

Keywords: PZT; multilayer films; phase transition; electrocaloric effect

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