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Electric field control of Martensitic Phase Transitions in Thin Films of Ni-Mn-In NABIL AL-AQTASH, University of Nebraska - Omaha, ANDREI SOKOLOV , University of Nebraska Lincoln , RENAT SABIRIANOV, University of Nebraska - Omaha — We propose the electric field control of martensite transformation of Ni-Mn-In thin films deposited on ferroelectric (FE) substrate. DFT- based calculations indicate that the off-stochiometric Ni2Mn1.5In0.5 alloy shows that the ferromagnetic (FM) cubic phase undergoes transformation to tetragonal ferromagnetic (FiM) martensite phase at low temperature. The presence of FE substrate changes the relative stability of FM austenite and FiM martensite phases. (SrZrO3/PbZrO3) superlattices were considered as FE substrates with polarization perpendicular to the interface. The relative stability of two phases of the thin films can be tuned by polarization reversal in FE due to the change in sign of induced charges at the interface. The energetically favorable structures of the FE/Ni2Mn1.5In0.5 systems depend on interface structure between FE and Ni2Mn1.5In0.5 layers, e.g Ni-(Pb-O) interface. The energy difference (per NiMnIn f.u) between FM austenite and FiM martensite states of the film on FE substrate is $\Delta E = 0.22$ eV with polarization away from interface, upon polarization reversal $\Delta E = 0.75$ eV, compared to ($\Delta E = 0.24$ eV) in the bulk. Additionally Pb atoms in PbO3 planes shifted in opposite direction with respect to oxygen planes and alter the chemical bonding of Pb with Ni atoms of the thin films. These changes possibly cause the shift of the martensite transition temperature. These results clearly indicate the possibility of control of martensitic transition in Ni-Mn-In thin films by FE substrate.

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