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Control of anisotropy and magnetism of MnBi nanomaterials[1]
WENYONG ZHANG, DAVID SELLMYER, Nebraska Center for Materials and Nanoscience, University of Nebraska, Lincoln, NE 68588 — High-anisotropy MnBi nanostructures have been fabricated by in-situ annealing of Bi/Mn/Bi multilayers and magnetic-field annealing of melt-spun Mn_xBi_{100-x} ribbons. The ratio of Mn to Bi affects the concentration of NiAs-type MnBi, the degree of c-axis orientation, and phase distribution. For x = 50, the Mn_xBi_{100-x} film exhibits the optimum nanostructure in which MnBi grains are uniformly separated by a thin layer of Bi. This has produced a record value of $(BH)_{max}$ = 16.3 MGOe for this compound. A good c-axis texture has been developed for $Mn_{50}Bi_{50}$ ribbons with a remanence ratio of 0.94 after magnetic-field annealing and this result subsequently leads to $(BH)_{max}$ = 9.2 MGOe, the highest value for bulk MnBi materials. The reason for the much higher energy product for the $Mn_{50}Bi_{50}$ film compared to the $Mn_{50}Bi_{50}$ ribbon is that the ribbon has a comparatively lower coercivity induced by inhomogeneous distribution of intergranular Bi. The effect of element doping, optimization of preparation parameters, and temperature dependence of properties also will be discussed.

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