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Fabrication of fully dense nanostructured MnBi magnet by hot compaction of cryo-milled powders[1] GEORGE HADJIPANAYIS, VENKATA RAMARAO NEELAM, ALEX GABAY, WANG LI, University of Delaware — Recently, rare-earth-free permanent magnets (REFPMs) have attracted much attention globally owing to rare-earth metal crisis and high cost. Among the REFPMs, MnBi is a potential candidate due to its unusual large magnetocrystalline anisotropy ($K \approx 10^7$ erg/cc) and positive temperature of coefficient of coercivity. In this work, we report for the first time a novel processing method that combines the cryo-milling with hot compaction to produce fully dense bulk nanostructured MnBi magnet. The effect of cryo-milling on particle size, phase formation, and magnetic properties of MnBi has been studied in detail. Also, the microstructural and magnetic properties of bulk nanostructured MnBi magnet were investigated. Adoption of cryo-milling results in nanocrystalline powders with particle size of 400-500 nm. Large coercivity (H_c) values of 18.5 kOe, and 12.9 kOe were obtained in cryo-milled powders and hot compacted magnet respectively. The MnBi magnet shows a large positive temperature coefficient of H_c and the H_c reaches a value of more than 30 kOe above 450 K.

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