

Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Anomalous Hall effect sensors based on magnetic element doped topological insulator thin films YAN NI, Iowa State University, ZHEN ZHANG, Purdue University, IKENNA NLEBEDIM, Ames Laboratory, U.S. Department of Energy, DAVID JILES, Iowa State University — Anomalous Hall effect (AHE) is recently discovered in magnetic element doped topological insulators (TIs), which promises low power consumption highly efficient spintronics and electronics. This discovery broaden the family of Hall effect (HE) sensors. In this work, both HE and AHE sensor based on Mn and Cr doped Bi_2Te_3 TI thin films will be systematically studied. The influence of Mn concentration on sensitivity of $\text{Mn}_x\text{Bi}_{2-x}\text{Te}_3$ HE sensors will be discussed. The Hall sensitivity increase 8 times caused by quantum AHE will be reported. AHE sensor based on Cr-doped Bi_2Te_3 TI thin films will also be studied and compared with Mn doped Bi_2Te_3 AHE sensor. The influence of thickness on sensitivity of $\text{Cr}_x\text{Bi}_{2-x}\text{Te}_3$ AHE sensors will be discussed. Ultrahigh Hall sensitivity is obtained in Cr doped Bi_2Te_3 . The largest Hall sensitivity can reach $2620 \text{ } \Omega/\text{T}$ in sensor which is almost twice higher than that of the normal semiconductor HE sensor. Our work indicates that magnetic element doped topological insulator with AHE are good candidates for ultra-sensitive Hall effect sensors.

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Date submitted: 06 Nov 2015

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