Abstract Submitted
for the 4CS21 Meeting of
The American Physical Society

Colossal magnetoresistance via avoiding fully polarized magnetization in the ferrimagnetic insulator $Mn_3Si_2Te_6$[1] YIFEI NI, HENGDI ZHAO, YU ZHANG, University of Colorado, Boulder, BING HU, University of Colorado, Boulder; North China Electric Power University, ITAMAR KIMCHI, Georgia Institute of Technology, GANG CAO, University of Colorado, Boulder — Colossal magnetoresistance is of great fundamental and technological significance and exists mostly in the manganites and a few other materials. Here we report colossal magnetoresistance that is starkly different from that in all other materials. The stoichiometric $Mn_3Si_2Te_6$ is an insulator featuring a ferrimagnetic transition at 78 K. The resistivity drops by seven orders of magnitude with an applied magnetic field above 9 T, leading to an insulator-metal transition at up to 130 K. However, the colossal magnetoresistance occurs only when the magnetic field is applied along the magnetic hard axis and is surprisingly absent when the magnetic field is applied along the magnetic easy axis where magnetization is fully saturated. The anisotropy field separating the easy and hard axes is 13 T, unexpected for the Mn ions with nominally negligible orbital momentum and spin-orbit interactions. Double exchange and Jahn-Teller distortions that drive the hole-doped manganites do not exist in $Mn_3Si_2Te_6$. The phenomena fit no existing models, suggesting a unique, intriguing type of electrical transport.

[1]This work is supported by NSF via Grant No. DMR 1903888.

Yifei Ni
University of Colorado, Boulder

Date submitted: 08 Sep 2021 Electronic form version 1.4