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Dissipationless anomalous transport properties and Mott relation in $\text{Ga}_{1-x}\text{Mn}_x\text{As}$ YONG PU, JING SHI, Dept. of Physics, UC-Riverside, DAICHI CHIBA, ERATO, JST; RIEC, Tohoku University, FUMIHIRO MATSUKURA, HIDEO OHNO, RIEC, Tohoku University; ERATO, JST — We have found an anomalously large Nernst effect (ANE) accompanying the anomalous Hall effect (AHE) in a series of $\text{Ga}_{1-x}\text{Mn}_x\text{As}$ ($x=0.04-0.07$) ferromagnetic semiconductor samples with perpendicular anisotropy. Without applying a magnetic field, non-zero ANE and AHE are observed, and both effects are very well scaled with the sample magnetization. We have developed a method, which does not depend on the accuracy of magnetization measurement, to study the anomalous transport effects. By measuring AHE and ANE under zero magnetic field and over a wide range of temperatures, we have demonstrated the dissipationless origin of the anomalous electrical and thermoelectric transport properties in these samples. Furthermore, we have successfully verified the Mott relation for the off-diagonal transport coefficients in the regime of dissipationless transport that may not depend on scattering.

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