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Thermo emf in a two-dimensional electron-hole system in HgTe quantum wells in the presence of magnetic field. The role of the diffusive and the phonon-drag contributions

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ABSTRACT

We present an experimental study of the thermo emf of a two-dimensional electron-hole system in a 21 nm HgTe quantum well in the presence of magnetic field. The first experimental observation of Nernst-Ettingshausen effect in a 2D semimetal is reported. The comparison between theory and experiment shows that the thermo emf is determined by two contributions: the diffusion and the phonon drag, with the latter contribution several times greater than the first. The conclusion is drawn about the important role of electron-hole scattering in the formation of both thermoelectric power mechanisms.

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REFERENCES

1. M. Z. Hasan and C. L. Kane, Rev. Mod. Phys. **82**, 3045 (2010). https://doi.org/10.1103/RevModPhys.82.3045, Google Scholar, Crossref

2. X.-L. Qi and S.-C. Zhang, Rev. Mod. Phys. **83**, 345 (2011)

Crossref

3. Z. D. Kvon, E. B. Olshanetsky, D. A. Kozlov, N. N. Mikhailov, and S. A. Dvoretskii, JETP Lett. **87**, 502 (2008). https://doi.org/10.1134/S0021364008090117, Google Scholar, Crossref

4. E. B. Olshanetsky, Z. D. Kvon, M. V. Entin, L. I. Magarill, N. N. Mikhailov, and S. A. Dvoretsky, JETP Lett. **89**, 290 (2009). https://doi.org/10.1134/S002136400906006X, Google Scholar, Crossref

5. M. V. Entin, L. I. Magarill, E. B. Olshanetsky, Z. D. Kvon, N. N. Mikhailov, and S. A. Dvoretsky, JETP **117**, 933 (2013). https://doi.org/10.1134/S1063776113130116, Google Scholar, Crossref

6. G. M. Gusev, E. B. Olshanetsky, Z. D. Kvon, L. I. Magarill, M. V. Entin, A. Levin, and N. N. Mikhailov, JETP Lett. **107**, 789 (2018). https://doi.org/10.1134/S0021364018120081, Google Scholar, Crossref

7. M. V. Entin and L. I. Magarill, to be published. Google Scholar

8. C. G. Van der Walle, Phys. Rev. B **39**, 1871 (1989). https://doi.org/10.1103/PhysRevB.39.1871, Google Scholar, Crossref

9. A. Qteiish and R. D. Needs, Phys. Rev. B **45**, 1317 (1992).