SCES 2022 Amsterdam

Book of abstracts

International Conference on Strongly Correlated Electron Systems (SCES)

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Anne Visser

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Large-gap insulating phase induced by magnetic ordering in a two-dimensional material at low temperature

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Diffusion of photo-excited holes in viscous electron fluid

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We address our investigation to the diffusion processes which take place in the hydrodynamic regime in a high-mobility mesoscopic GaAs channel, where strongly correlated electrons reveal hydrodynamic behavior [1,2]. In particular, we report on a photocurrent study of diffusion of the photo-generated holes within a viscous electron fluid. Scanning PC microscopy was performed at the 3.7 K in a multi-terminal Hall bar structure with the 5 μm width and 100 μm length of the channel area, fabricated using a 14 nm thick GaAs/AlGaAs quantum well. The sheet electron density and the mobility measured at 1.4 K were $9.1 \cdot 10^{11}$ cm^{-2} and $2.0 \cdot 10^{6}$ cm^2/Vs, respectively. It was shown that the observed diffusion is due to the photo-generated heavy and light holes. The effective viscosity of the electron-hole system was determined. The presented results differ from the hydrodynamic effects observed so far in viscous electron systems, since in the reported case the diffusion of holes occurs within a mixture consisting of the hydrodynamic electrons and the injected photo holes.

[1] D. Levin, G. M. Gusev, E. V. Levinson, Z. D. Kwon, and A. K. Bakarov, *Phys. Rev. B*97, 245308 (2018).

[2] G. M. Gusev, A. D. Levin, E. V. Levinson, and A. K. Bakarov, *Phys. Rev. B*98, 161303(R), (2018).