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Density imbalance effect on the Coulomb drag upturn in an undoped electron-hole bilayer CHRISTIAN MORATH, JOHN SEAMONS, JOHN RENO, MIKE LILLY, Sandia National Lab — A low-temperature upturn of the Coulomb drag resistivity measured in an undoped electron-hole bilayer (uEHBL) device, possibly manifesting from exciton formation or condensation, was recently observed. The effects of density imbalance on this upturn are examined. Measurements of drag as a function of temperature in a uEHBL with a 20 nm wide $Al_{.90}Ga_{.10}As$ barrier layer at various density imbalances n≠p are presented. The results show drag increasing as the density of either two dimensional system was reduced, both within and above the upturn temperature regime and with a significantly stronger dependence than the $(np)^{-3/2}$ predicted by the weak-coupling theory. A comparison of the data with numerical calculations of drag in the presence of electron-hole pairing fluctuations, which qualitatively reproduce the drag upturn behavior and easily accommodates density imbalance effects, is also presented. The calculations predict a peak in drag at matched densities, which is not reflected in the measurements. This work has been supported by the Division of Materials Sciences and Engineering, Office of Basic Energy Sciences, U.S. Department of Energy. Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy under Contract No. DE-AC04-94AL85000.

Christian Morath
Sandia National Lab

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