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Undoped Electron-Hole Bilayers in a GaAs/AlGaAs Double Quantum Well J.A. SEAMONS, D.R. TIBBETTS, J.L. RENO, M.P. LILLY, Sandia National Laboratories — There is intense interest in exciton condensation effects that can occur in bilayer systems. While exciton condensation effects have been studied in quantum hole bilayers, transport experiment in the exciton condensation regime of electron-hole bilayers have proved to be extremely difficult. We present the fabrication details and device measurements of completely undoped electron-hole bilayer devices in a GaAs/AlGaAs double quantum well heterostructure. The quantum wells are separated by a 90% AlGaAs barrier with thicknesses of 20 nm or 30 nm depending upon the device. These devices have independently tunable densities of the two-dimensional electron gas and two-dimensional hole gas. We report four-terminal transport measurements of the independently contacted electron and hole layers with balanced densities from 1.2 x 10^{11}cm^{-2} down to 4 x 10^{10}cm^{-2} at T = 300 mK. Coulomb drag results from these devices will be presented. The mobilities can exceed 1 x 10^6 cm^2 V^{-1} s^{-1} for electrons and 4 x 10^5 cm^2 V^{-1} s^{-1} for holes. 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.

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