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The Zero-Resistance States in InN Films XIAOWEI HE, IVAN KNEZ, YANHUA DAI, RUIRUI DU, Rice University, XINQIANG WANG, BO SHEN, Peking University, RICE UNIVERSITY COLLABORATION, PEKING UNIVERSITY COLLABORATION — InN is a narrow gap semiconductor which possesses interesting transport properties. Besides the 2D electron accumulation layer on the surface, low temperature zero-resistance states have been observed in InN thin films and attributed to superconductivity. In order to elucidate the origin of superconductivity, we have studied systematically the temperature and magnetic field dependences of resistance in InN films of various thicknesses. High quality InN film samples of thickness between 50 nm and 5 μm were grown by molecular beam epitaxy on Al_2O_3 substrate with a GaN buffer layer. Typically these films have an electron density of 3x10^{17}- 6 x10^{18} cm^{-3}, and the mobility between 1000-2400 cm^2/Vs at 300 mK. Zero-resistance states were observed in films of thickness above 1 μm with the transition temperature of $\sim$ 1K, along with marked nonlinear I-V characteristics suggesting the presence of supercurrent. We observed anisotropic dependences of resistance on in-plane magnetic fields with respect to the direction of applied current. This work in Rice was supported by NSF DMR-0706634 and Welch Foundation C-1682, in Peking University was supported by the NSFC of China (Nos. 60990313, 10774001), and RFDP (No. 20090001120008).

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