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Ambipolar Transistors with Heterostructures of Single-Walled Carbon Nanotubes and Zinc Tin Oxide BONGJUN KIM, SEONPIL JANG, Microelectronics Research Center, The University of Texas at Austin, MICHAEL GEIER, MARK HERSAM, Department of Materials Science and Engineering, Northwestern University, ANANTH DODABALAPUR, Microelectronics Research Center, The University of Texas at Austin — The unique operation of ambipolar thin-film transistors (TFTs), in which both electrons and holes can be injected and transported in a single device, have attracted significant attention since it was first demonstrated in mid-1990s. In addition to their unique operation, these devices have great potential in complementary-like circuits and novel light emitting transistors. Single-walled carbon nanotubes (SWCNTs) exhibit ambipolar behavior intrinsically; however, SWCNTs under ambient conditions show strong p-type behavior due to adsorption of oxygen and moisture from air. In this work, we will discuss the performance characteristics of ambipolar TFTs with heterostructures of a network of SWCNTs and amorphous zinc tin oxide. These TFTs exhibit well-balanced electron and hole mobilities under ambient conditions, and both carriers are injected through Ti/Au contacts without large injection barriers. Charge transport in this material system will be described. In addition, complementary-like inverters which are composed of two ambipolar TFTs will be demonstrated.

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