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Exploiting Semiconductor to Metallic Phase Transformation in Layered Transition Metal Dichalcogenides for Ohmic contact Contacts RAJESH KAPPERA, DAMIEN VOIRY, WESLEY JEN, Rutgers University, SIBEL EBRU YALCIN, GAUTAM GUPTA, ADITYA MOHITE, Los Alamos National Lab, MANISH CHHOWALLA, Rutgers University, MATERIAL SCIENCE DEPARTMENT, RUTGERS UNIVERSITY, PISCATAWAY, NJ, 08854, USA TEAM, CENTER FOR INTEGRATED NANOTECHNOLOGIES, LOS ALAMOS NATIONAL LABORATORY, LOS ALAMOS, NM, 87544, US TEAM — Achieving ohmic contacts to transition metal dichalcogenides (MoS_2, WS_2, WSe_2 and $MoSe_2$) has been a challenge for researchers owing to the formation of a large Schottky barrier between metal and semiconductor. This results in low on-currents, mobilities and sub-threshold swings in the devices made with these materials. Here we report a universal strategy using chemical approach to reversibly transform the semiconducting phase (2H) to metallic phase (1T). Taking advantage of the metallic phase, we have fabricated hybrid transistors, which have 1T phase contacts and semiconducting 2H phase of the material as the channel. The metallic phase dramatically reduces the Schottky barrier between the metal and the semiconductor thereby mitigating the high contact resistance issues. This strategy should be applicable to several other applications such as catalysis, supercapacitors and batteries. Detailed synthesis, structural, electrical and optical characterization will be described.

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