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Ambipolar Transport and Gate-Induced Superconductivity in Layered Transition Metal Dichalcogenides WU SHI, JIANTING YE[1], YI-JING ZHANG, RYUJI SUZUKI, YU SAITO, YOSHIHIRO IWASA, Univ of Tokyo
— Transition metal dichalcogenides (TMDs) are well known van der Waals layered materials that are easy to be exfoliated into atomically flat nano scale flakes. Owing to high efficiency of electrical double layer (EDL) dielectrics, thin flakes of TMDs have achieved high performance ambipolar transistor operation and established metallic states with high mobility, which are ideal for inducing superconductivity. Here, we report a comprehensive study of ambipolar transport behaviors in the EDL transistors (EDLTs) of MoS_2, $MoSe_2$ and $MoTe_2$ thin flakes down to 2 K. In comparison, $MoSe_2$ EDLT displayed a well-balanced ambipolar transistor operation while the other two showed opposite predominance in electron and hole accumulation, respectively. By modulation of carrier densities, the metal insulator transition (MIT) was observed in both electron and hole transport measurements. Particularly, superconducting transitions were reached after the formation of metallic states in the electron side. The phase diagram of transition temperature-carrier density was established and a dome-shaped structure was confirmed, revealing a universal feature of gate-induce superconductivity in layered band insulators.

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