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Superconductivity Series of Ion-gated Transition Metal Dichalcogenides WU SHI, JIANTING YE[1], YIJING ZHANG, RYUJI SUZUKI, MASARO YOSHIDA, NAOKO INOUE, YU SAITO, YOSHIHIRO IWASA, Univ. of Tokyo
— Semiconducting transition metal dichalcogenides (TMDs) have attracted considerable interest as typical two-dimensional (2D) materials. By mechanical cleavage, atomically flat and chemically stable thin flakes of TMDs can be readily obtained from bulk crystals. Recently, coupling with high efficient ionic media, TMD thin flakes have exhibited extraordinary electronic and opto-valleytronic properties in the form of electrical double layer transistors (EDLTs). The introduction of high-density carriers have also induced metal-insulator transition and superconductivity in MoS2, revealing an enhanced Tc and a dome-like phase diagram that are inaccessible through conventional chemically doping. In this work, we report the discovery of a superconductivity series based on a further exploration of other available semiconducting TMDs (MoSe2, MoTe2, WS2, WSe2) by using different ionic media. The present results not only complement important superconducting properties in TMDs, but also suggest a close correlation between transistor operation and the possibility of inducing superconductivity, providing general guidelines for the optimization of charge accumulation and the induction of superconductivity in other material series via ionic gating.

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