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Electric field induced superconductivity in a layered transition metal chalcogenide J.T. YE, Y.J. ZHANG, Y. MASTUHASHI, Y. IWASA, Department of Applied Physics, The University of Tokyo — Recent developments in electric double layer transistors (EDLTs) are attracting growing interests because of its stronger field effect orders of magnitude larger than other transistor techniques This method provides unique abilities to reach the high carrier densities required for inducing superconductivity in several kinds of materials. Among them, layered materials are convenient examples to work with since high quality surface suitable for transistor channel could be easily obtained after mechanical cleavage. Especially, after the introduction of graphene techniques, high quality atomically flat surface can be routinely fabricated on a broad range of layered materials. Combining EDL with novel materials processing techniques on layered materials provides new opportunities in manipulating their electronic properties. We can achieve high carrier density up to 10^{14} cm^{-2} electrostatically in layered materials and induce metal insulator transitions. Superconductivity, similar as that shown in ZrNCl EDL transistor, could be observed when we cool down the system to low temperature after inducing a metal insulator transition with large amount of accumulated carriers. The versatility of this combination shows its potential as a protocol to study varieties of layered materials for broader scope of possibilities in accessing their superconductivities. And hopefully, this method could also facilitate to induce superconductivity in new materials.

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