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Tunable CDW and Superconductivity Phase Transitions in 1T-TaS_2 Thin Films through Gate-controlled Intercalation YIJUN YU, FANGYUAN YANG, State Key Laboratory of Surface Physics and Department of Physics, Fudan University, YAJUN YAN, Hefei National Laboratory for Physical Science at Microscale and Department of Physics, University of Science and Technology of China, YOUNGJAI CHOI, Rutgers Center for Emergent Materials, and Department of Physics and Astronomy, Rutgers University, SEJOONG KIM, YOUNG-WOO SON, Korea Institute for Advanced Study, Seoul, Korea, SANG-WOOK CHEONG, Rutgers Center for Emergent Materials, and Department of Physics and Astronomy, Rutgers University, XIANHUI CHEN, Hefei National Laboratory for Physical Science at Microscale and Department of Physics, University of Science and Technology of China, YUANBO ZHANG, State Key Laboratory of Surface Physics and Department of Physics, Fudan University — 1T-TaS_2 has a rich set of complex phases as a result of competition among multiple electronic orders in this layered material. The delicate balance among the various phases makes 1T-TaS_2 very sensitive to external modulations. Using PEO/$LiClO_4$ solid electrolyte as a medium between a gate electrode and the sample, we have successfully intercalated Li ions into 1T-TaS_2 thin flakes in a continuous and reversible way. This allows us to probe the interplay between CDW phases, Mott phase, and superconducting phase as the concentration of Lithium is varied. Apart from 1T-TaS_2, our method of controlled intercalation is a promising new technique which could be applied to other layered materials.

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