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In search of single layer superconductivity in semiconducting transition metal dichalcogenides EFREN NAVARRO-MORATALLA, YAFANG YANG, HUGH CHURCHILL, PABLO JARILLO-HERRERO, Department of Physics, Massachusetts Institute of Technology — Charge carrier density control is a keystone in the study of 2D semiconductors. The use of ionic liquids as gate electrodes gives rise to the formation of high capacitance electrical double layers (EDLs) that permit exploring very high carrier density regimes ($n \approx 10^{15}$ cm^{-2}), opening the door for the study of field-induced correlated states, such as ferromagnetism or superconductivity. Though pioneering works on transition metal dichalcogenides have provided with proof of the use of EDLs for the induction of superconductivity in bulk crystals or in the surface of thick flakes, no reports of single layer superconductivity have been put forward. We take advantage of crystal growth techniques, the EDL approach, the wide range of metal dichalcogenides and the van der Waals stacking to fabricate ultraflat samples that will permit exploring the high carrier density regime in search for switchable single layer superconductivity. The use of a liquid gate opens the possibility of studying the effect that strain or even the presence of molecular species may have in the superconducting state.

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