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Gate Dependent Photoluminescence in Two-dimensional Transition Metal Dichalcogenides van der Waals Heterostructure devices. LUIS A. JAUREGUI, ANDREW JOE, KATERYNA PISTUNOVA, ALEX HIGH, KRISTIAAN DE GREVE, GIOVANNI SCURI, Harvard University, Physics Department, YOU ZHOU, Harvard University, Chemistry Department, HONGKUN PARK, Harvard University, Chemistry and Physics Department, MIKHAIL LUKIN, PHILIP KIM, Harvard University, Physics Department — Single layer transition metal dichalcogenides (TMDC) are 2-dimensional (2D) semiconductors characterized by a direct optical bandgap in the order of 2 eV and large exciton binding energies (>100 meV). We fabricate van der Waals heterostructure devices made of 2D TMDCs with hexagonal Boron nitride (h-BN) as gate dielectric, with top and bottom gate electrodes and ohmic contacts down to cryogenic temperatures (T = 3K). We study the evolution of photoluminescence (PL) with electric field, carrier density, and temperature. Our measured low-temperature PL peaks show full width at half maxima on the order of ˜1meV. The amplitude of the photoluminescence peak, corresponding to the neutral and charged exciton emission (also their energy), can be manipulated with top and bottom gates.

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