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Electrically tunable strong light-matter coupling in a transition metal dichalcogenide monolayer embedded in a plasmonic crystal cavity

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Two-dimensional transition-metal dichalcogenide (TMDC) monolayers exhibit direct bandgap excitons with large binding energy. The optical response of TMDCs is electrically tunable over a broad wavelength range, making these 2D materials promising candidates for optoelectronic devices. In this work, we enhance exciton-plasmon coupling by embedding a single layer of tungsten diselenide (WSe2) into a plasmonic crystal cavity, which confines surface plasmon polaritons in an analogous manner to photonic crystal cavities. We observe strong light–matter interactions and the formation of microcavity polaritons when the cavity mode is on resonance with the exciton absorption in WSe2. Using the electrostatically controllable response of such excitons, we also demonstrate tunable vacuum Rabi splitting in such a system.

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