Mott Insulator Polariton in MoSe2/WS2 Moiré Lattice

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Abstract— Transition metal dichalcogenide moiré superlattices host rich correlated electronic states with high tunability. Their integration with optical cavities offers a new platform to explore hybrid light-matter interactions. However, the interplay between electron correlations and polariton formation remains uncharted. Here, we demonstrate the realization of a Mott insulator polariton in a gate-tunable MoSe2/WS2 moiré heterostructure embedded in a microcavity at the moiré lattice filling of $v = 1$. A silver top layer was used to gate the moiré lattice and form the cavity reflection layer. Magnetic field studies indicate that the polaritons inherit valley Zeeman splitting from the moiré excitons, exhibiting saturation behavior similar to the bare moiré excitons. Our work establishes moiré polaritons as an electrically and magnetically tunable platform for engineering quantum phases of light and matter.