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Exciton-Polariton Dynamics of a Monolayer Semiconductor Coupled to a Microcavity[1] YEN-JUNG CHEN, TEODOR K. STANEV, NATHANIEL P. STERN, Department of Physics and Astronomy, Northwestern University, JEFFREY D. CAIN, VINAYAK P. DRAVID, Department of Materials Science and Engineering, Northwestern University — Strong light-matter interactions, evidenced by exciton-polariton states, have been observed in the two-dimensional limit with monolayer transition metal dichalcogenides (TMDs) embedded in a microcavity[2]. Because of the valley degree of freedom in monolayer TMDs, these hybrid light-matter states can exhibit valley polarization as in a bare monolayer, with strongly-coupled dynamics determined by the relative rates of exciton relaxation and intervalley scattering, which can be highly modified in on-resonant cavities[3]. Here, we test this intuitive picture of the polarized exciton-polariton dynamics with monolayer MoS_2 coupled to detuned cavities. Upper and lower polariton branches exhibit distinct decay rates indicative of different cavity dynamics. As with on-resonant, strongly-coupled exciton-polaritons, the weakly-coupled regime causes exciton-polariton valley polarization to persist at room temperature, demonstrating that dynamics of valley-polarized excitations can be controlled by engineering light-matter interactions.

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[2] X. Liu, *et al. Nature Photon.* **9**, 30 (2015)

[3] Y-J. Chen, *et al. CLEO: Science and Innovations.* STu3F–2 (2016)

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