Abstract Submitted
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Ultrafast Band and Gap Renormalization Induced by Excitonic Electron-Hole Liquid in Monolayer MoS2[1] YI LIN, Lawrence Berkeley National Laboratory — Extreme-UV time-resolved photoemission spectroscopy is used to study the ultrafast band and gap dynamics in photon-excited monolayer MoS2 on HOPG with carrier densities below Mott threshold. We observe band renormalizations for both valence and conduction bands at K valley of the ML MoS2 and realize an unexpected increase of the band gap up to 50 meV with simultaneously enhancement of band effective mass at ultrafast timescale. We also observe a transient satellite band emerging closely above the valence band maximum. We resort to the quasi-equilibrium theory of electron-hole liquid to calculate the ML MoS2 spectral functions dressed by the photoexcited excitons. Our theoretical results agree well with the experimental observations, revealing the intriguing complex correlations between the electronic structure and excitonic quasi-particles in ML MoS2.

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