MEASUREMENT AND EXCITED STATE PREDICTION OF PHOTOEXCITED ELECTRON AND HOLE DYNAMICS IN ZnTe WITH TRANSIENT ULTRAVIOLET REFLECTION SPECTROSCOPY

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Transient extreme ultraviolet (XUV) spectroscopy is becoming well developed for the study of transition metal oxides like those used in solar fuel generation. Si and Ge compounds, other popular solar energy semiconductors, have been used as test cases for the ab-initio prediction of XUV edges and their photoexcited change. Here, we use transient XUV spectroscopy to study the ultrafast carrier dynamics of ZnTe, both as a CO_2 reduction material of interest to the LiSA (Liquid Sunlight Alliance) initiative as well as a test of our group's ab-initio methods. XUV spectra were taken in a grazing reflection geometry to enhance the sensitivity to carrier dynamics at the ZnTe surface. The Te 4d core-to-valence transition is then measured after broad and narrow band excitation replicating solar or UV light, respectively. Electron and hole energies are observed as a function of time by state-filling effects. A fast electronic response is observed within the ZnTe bandgap and is compared to theoretical signatures of photoexcited renormalization or surface states.