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Ultrafast Band Structure Dynamics in Bulk VSe2

Complex materials encompassing different phases of matter can display new photoinduced metastable states differing from those attainable under equilibrium conditions. These states can be realized when energy is injected in the material following a non-equilibrium pathway, unbalancing the unperturbed energy landscape of the material. Guided by the fact that photoemission experiments allow for detailed insights in the electronic band structure of ordered systems, here we study bulk 1T-VSe2 in its metallic and charge-density-wave phase by time- and angle-resolved photoelectron spectroscopy. After near-infrared optical excitation, the system shows a net increase of the density of states in the energy range of the valence bands, in the vicinity of the Fermi level, lasting for several picoseconds. We discuss possible origins as band shifts or correlation effects on the basis of a band structure analysis. Our results uncover the possibility of altering the electronic band structure of bulk 1T-VSe2 for low excitation fluences, contributing to the understanding of light-induced electronic states.

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