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Evidence for impact ionization in vanadium dioxide

STEPHEN MCGILL, National High Magnetic Field Laboratory

Pump-probe optical spectroscopy was used to investigate charge carrier multiplication via the process of impact ionization in the M1 insulating phase of VO₂. The film was excited by optical pump pulses with energy both above and below twice the band gap energy and observed with two different probe wavelengths, and the reflectivities of the sample were then compared. We observed an enhancement of the reflectivity for the higher energy pump pulses near zero delay compared to the reflectivity for the lower energy pump pulses for both probe wavelengths. Additionally, we identified multiple timescales within the charge dynamics and observed a significant change in the dynamics between the two pump wavelengths for one of these timescales. This research was funded by NSF DMR-1229217.