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Temperature dependence of laser induced insulator-metal transition in VO_2[1] SIMING WANG, Center for Advanced Nanoscience, University of California San Diego, La Jolla, California, USA, SHIMSHON BAR-AD, Tel Aviv University, Tel Aviv, Israel, JUAN GABRIEL RAMIREZ, Center for Advanced Nanoscience, University of California San Diego, La Jolla, California, USA, DAN HUPPERT, Tel Aviv University, Tel Aviv, Israel, IVAN K. SCHULLER, Center for Advanced Nanoscience, University of California San Diego, La Jolla, California, USA — We performed optical pump-probe experiments on VO_2 thin films with low laser fluence at temperatures ranging across the insulator-metal transition (IMT). At room temperature, the reflectivity of VO_2 increases in the first 400-500 fs when pumped by 150 fs laser pulses. An exponential decay of the reflectivity is observed in the following 1 ps. Interestingly, as the temperature approaches the transition temperature (340 K), the reflectivity shows a second increase on an 80 ps time scale following the exponential decay, indicating an IMT. We propose that the decay of the reflectivity is due to electron-phonon thermalization, which raises the phonon temperature and causes a superheating of the lattice. This process provides the latent heat and induces the IMT on the 80 ps time scale. The coexistence of the insulating and metallic phases is observed in the reflectivity measurements for temperatures above 340 K.

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