

101. Title: Ultrafast insulator-metal phase transition in VO₂ studied by multiterahertz spectroscopy
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Abstract: The ultrafast photoinduced insulator-metal transition in VO₂ is studied at different temperatures and excitation fluences using multi-THz probe pulses. The spectrally resolved midinfrared response allows us to trace separately the dynamics of lattice and electronic degrees of freedom with a time resolution of 40 fs. The critical fluence of the optical pump pulse, which drives the system into a long-lived metallic state, is found to increase with decreasing temperature. Under all measurement conditions, we observe a modulation of the eigenfrequencies of the optical phonon modes induced by their anharmonic coupling to the coherent wave-packet motion of V-V dimers at 6.1 THz. Furthermore, we find a weak quadratic coupling of the electronic response to the coherent dimer oscillation resulting in a modulation of the electronic conductivity at twice the frequency of the wave-packet motion. The findings are discussed in the framework of a qualitative model based on an approximation of local photoexcitation of the vanadium dimers from the insulating state.