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THz induced insulator to metal transition in VO_2 metamaterial MENGKUN LIU, Boston University, HAROLD HWANG, Massachusetts Institute of Technology, HU TAO, Tufts University, ANDREW STRIKWERDA, KEBIN FAN, GEORGE KEISER, AARON STERNBACH, Boston University, KEVIN WEST, SALINPORN KITTIWATANAKUL, JIWEI LU, STUART WOLF, University of Virginia, FIORENZO OMENETTO, Tufts University, XIN ZHANG, Boston University, KEITH NELSON, Massachusetts Institute of Technology, RICHARD AVERITT, Boston University — We use metamaterial enhanced high field terahertz (THz) pulses (up to ∼4MV/cm) to induce the insulator-to-metal transition in vanadium dioxide (VO_2) thin films at 320K. Ultrafast THz field enhancement in the gaps of metamaterial split ring resonators releases free electrons in VO_2 by the Poole-Frenkel effect. The accelerated hot electrons transfer energy to the lattice via electron phonon coupling inducing the persistent metallic phase. A large nonlinear signature is observed in VO_2 as modulations of the metamaterial resonance on a picosecond time scale. Our results provide insight into electric field induced phase transitions in VO_2 and paves the way for studying nonlinear high THz field effects in many other strongly correlated materials.

[X] Prefer Oral Session
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