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THz spectroscopy of optically and thermally induced metallic states in nanogranular vanadium dioxide T.L. COCKER, L.V. TITOVA, Department of Physics, University of Alberta, Edmonton, Alberta T6G 2G7, Canada, S. FOURMAUX, H.-C. BANDULET, D. BRASSARD, J.-C. KIEFFER, M.A. EL KHAKANI, INRS-EMT, Université du Québec, Varennes, Québec J3X 1S2, Canada, F.A. HEGMANN, Department of Physics, University of Alberta, Edmonton, Alberta T6G 2G7, Canada — VO_2 is a model correlated electron system that undergoes an insulator-metal phase transition when heated above 341K or pumped by an ultrafast laser pulse. Potential technological applications look to utilize its drastic change in optical and electronic properties and rapid switching upon photoexcitation. Progress hinges on understanding the nature of carrier conduction in the metallic state, while the driving mechanism behind the phase transition is interesting from a fundamental research perspective. We present a characterization of the electron dynamics in nanogranular VO_2 via time-resolved terahertz (THz) spectroscopy. A hysteresis is observed in the THz complex conductivity as a function of temperature. The shape of the photo-induced transient conductivity matches this signature at early times, but evolves into a different form at later times (>20 ps). The Drude-Smith model is used to analyze and explain our results.

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