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Phase inhomogeneity near the electrically driven insulator-metal transition in VO_2 nanobeams[1] SUJAY SINGH, Department of Physics, University at Buffalo, State University of New York, Buffalo, NY 14260, USA, GREGORY HORROCKS, Department of Chemistry, Texas A&M University, College Station, TX 77843, USA, PETER MARLEY, Department of Chemistry, University at Buffalo, State University of New York, Buffalo, NY 14260, USA, ZHENZHONG SHI, Department of Physics, University at Buffalo, State University of New York, Buffalo, NY 14260, USA, SARBAJIT BANERJEE, Department of Chemistry, Texas A&M University, College Station, TX 77843, USA, G. SAMBANDAMURTHY, Department of Physics, University at Buffalo, State University of New York, Buffalo, NY 14260, USA — Vanadium oxide (VO_2) exhibits an insulator to metal transition (IMT) at $T_C \sim 342$ K and this transition is amenable to triggering by voltage, light and strain. We present results from transport measurements (both AC and DC) on individual nanobeams of single crystalline VO_2 across the electrically driven transition from the insulating phase. Recent works in correlated electron systems have debated the individual roles of mechanisms such as Joule heating, percolation and avalanche in driving the transition. In our samples, the calculated average temperature of the nanobeams due to Joule heating is less than T_C near the IMT, suggesting that an inhomogeneous phase develops and filamentary conduction paths likely drive the transition. At low bias values, the conduction is dictated by Joule heating and percolation-like events. The occurrence of avalanche-type events at higher bias likely induces the formation of filamentary pathways, thereby precluding further need for percolation.

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