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Correlation-driven metal-insulator transition in $Cu_xV_2O_5$ nanobeams probed by resistance noise spectroscopy

ALI ALSAQQA, COLIN KILCOYNE, AHMED ALI, State Univ of NY - Buffalo, JUSTIN ANDREWS, PETER MARLEY, SARBAJIT BANERJEE, Texas A M University, G. SAMBANDAMURTHY, State Univ of NY - Buffalo — Nanoscale vanadium oxide bronzes have attracted interest due to the interesting phenomena they exhibit ranging from charge ordering, superconductivity and metal insulator transitions. We present results from a transport and resistance noise study of single crystalline nanobeams of $\beta' - Cu_xV_2O_5$. Resistance noise spectroscopy is a sensitive tool to understand local electronic and structural changes across a phase transition and we employ the method to understand the metal-insulator transition in individual nanobeams of $\beta' - Cu_xV_2O_5$. The nanobeams show a metal-insulator transition upon cooling from room temperature with a $T_{MI} \sim 210$ K. The low-frequency (¡ 1 Hz) noise magnitude shows a bump-like increase near the phase transition and deviation from a simple 1/f behavior. The probability density function of the resistance fluctuations shows signatures of non-Gaussian fluctuators near the transition and can be interpreted as a strong indicator of a correlation-driven phase transition. The roles of Mott physics, charge ordering and further avenues to tune the transition for potential applications as Mott field effect transistors will be discussed.

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