Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Metal-insulator transition in individual nanowires of doped-V2O5

TAILUNG WU, Dept. of Physics, C.J. PATRIDGE, S. BANERJEE, Dept. of Chemistry, G. SAMBANDAMURTHY, Dept. of Physics, University at Buffalo-SUNY, Buffalo, NY 14260 — Recent studies on doped vanadium oxide bronzes ($M_xV_2O_5$) have shown remarkable transport and magnetic properties including charge and spin ordering, paramagnetism, gapless states and superconductivity. Here we present the results of transport measurements in single nanowires of $M_xV_2O_5$ ($M = K$, Cu, Na or W). Individual nanowire devices are prepared by standard lithographic techniques and resistance (R) is measured as a function of temperature (T). R vs. T behavior of a typical nanowire shows multiple jumps in R and hysteresis between 300 and 400 K, suggesting that metal-insulator transitions in individual nanowires may occur in several steps, changing parts of the wire from one phase to another as T is varied. Metal-insulator transition in isolated nanowires is studied when the dopant composition, diameter or length is varied.

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Date submitted: 28 Nov 2009 Electronic form version 1.4