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stoichiometry engineering of metal-insulator transition in suspended single crystalline vanadium dioxide nanobeams SHIXIONG ZHANG, IN SOO KIM, LINCOLN J. LAUHON, Department of Materials Science and Engineering, Northwestern University — While the metal-insulator transition (MIT) in VO2 bulk and thin films has been investigated for several decades, recent studies of nanobeams have provided new opportunities to investigate and manipulate the metal-insulator transition and structural domain formation in a correlated manner. We will describe the electrical and structural characterization of suspended single crystal VO2 nanobeams grown/annealed under various conditions. Annealing nanobeams under reducing conditions led to the stabilization of single-crystal rutile nanobeams at room temperature, in some cases suppressing the MIT temperature from 340 K down to below 100 K. Re-annealing under oxidizing conditions led to a recovery of the transition temperature for stoichiometric VO2. Furthermore, growth under oxidizing conditions produced the Mott insulator M2 phase and an intermediate M3. Systematic annealing studies enabled the generation of a pseudo-phase diagram with dimensions of stoichiometry and temperature. The temperature dependence of the electrical resistivity of rutile nanobeams above the transition temperature will also be discussed.

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