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Substrate Temperature effect on the transition characteristics of Vanadium (IV) oxide¹ TSUNG-HAN YANG, WEI WEI, CHUNMING JIN, JAY NARAYAN, Material Science and Engineering, NC State U — One of the semiconductor to metal transition material (SMT) is Vanadium Oxide (VO₂) which has a very sharp transition temperature close to 340 K as the crystal structure changes from monoclinic phase (semiconductor) into tetragonal phase (metal phase). We have grown high-quality epitaxial vanadium oxide (VO₂) films on sapphire (0001) substrates by pulsed laser deposition for oxygen pressure 10-2torr and obtained interesting results without further annealing treatments. The epitaxial growth via domain matching epitaxy, where integral multiples of planes matched across the film-substrate interface. We were able to control the transition characteristics such as the sharpness (T), amplitude (A) of SMT transition and the width of thermal hysteresis (H) by altering the substrate temperature from 300 °C, 400 °C, 500 °C, and 600 °C. We use the XRD to identify the microstructure of film and measure the optical properties of film. Finally the transition characteristics is observed by the resistance with the increase of temperature by Van Der Pauw method from 25 to 100 °C to measure the electrical resistivity hysteresis loop during the transition temperature.

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