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A Novel approach towards integration of VO_2 thin films on Si(100) for thermal switching devices applications ALOK GUPTA, RAVI AGGARWAL, JAGDISH NARAYAN, Department of Materials Science & Engineering, North Carolina State University — VO_2 exhibits a very interesting semiconductor to metal transition (SMT) as the crystal structure changes from monoclinic to tetragonal upon heating close to 68C. Parameters associated with SMT in VO_2 thin films, such as, transition temperature (T_t), hysteresis (ΔH), transition width (ΔT) and the order of magnitude change (ΔA) are a strong function of microstructure, orientation, and stoichiometry. We have developed a novel method to produce epitaxial VO_2 thin films with controlled SMT characteristics and its integration with Si(100) substrate which is of immense technological importance due to a variety of sensor- and memory-type applications. We have optimized the deposition conditions for the growth of epitaxial VO_2 films on Si substrate using a pulsed-laser deposition method. The integration of VO_2 with Si was accomplished via domain matching epitaxy of TiN and MgO intermediate layers on Si. XRD and HR-XTEM studies were carried out and resistance measurements were done to quantify the SMT parameters as a function of microstructure and composition. We have established structure-property correlations and related to our phenomenological model based upon thermodynamics.

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