Abstract Submitted
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Tuning the metal-insulator transition of VO2 by introducing W dopants via a combinatorial approach[1] YANGANG LIANG, SEUNGHUN LEE, XIAOHANG ZHANG, ICHIRO TAKEUCHI, Department of Materials Science and Engineering Center for Nanophysics and Advanced Materials, University of Maryland, College Park — We have systematically studied the structural phase transition and the electronic properties of composition spread $V_{1-x}W_xO_2$ ($0 \leq x \leq 0.037$) thin films fabricated on silicon (001) and c-cut sapphire substrates through combinatorial pulsed laser deposition of a V_2O_5 target and a WO_3 target. Our in-situ temperature-dependent x-ray diffraction measurements reveal a gradual change in the film structure from a monoclinic phase to a tetragonal phase via an intermediate mixture of the two as the concentration of tungsten increases from 0% to 3.7% at 300 K. At 358 K, the film is found to be in a tetragonal phase for the entire composition range we studied. The results also suggest that the volume of the unit cell increases as the concentration of tungsten increases. Electrical transport results further show that both the phase transition temperature and the width of the hysteresis loop decrease with the increasing of the concentration of tungsten. Especially, epitaxial $V_{1-x}W_xO_2$ films fabricated on c-cut sapphire substrates show narrower hysteresis loop compared to textured $V_{1-x}W_xO_2$ films fabricated on Si (100) substrates. In addition, the Hall effect measurements on the epitaxial $V_{1-x}W_xO_2$ thin films at various temperature points provide important information for the change in the electronic structure upon increasing the concentration of tungsten.

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