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Ferromagnetism in Rutile Structure Cr doped VO_2 Thin Films prepared by Reactive Bias Target Ion Beam Deposition KEVIN G. WEST, JIWEI LU, LI HE, DAVID M. KIRKWOOD, WEI CHEN, University of Virginia, T. PAUL ADL, Micron Technology, MICHAEL S. OSOFSKY, SYED B. QADRI, US. Naval Research Labs, ROBERT HULL, STUART A. WOLF, University of Virginia
— First generation spintronics has entered the mainstream of information technology through its utilization of the Magnetic Tunnel Junction (MTJ) in applicable devices such as read head sensors for hard disk drives and Magnetic Random Access Memory (MRAM). The future of spintronic devices requires next generation spintronic materials. Here we report on the novel structural, transport, and magnetic characteristics of $V_{1-x}Cr_xO_2$ ($0.1 \leq x \leq 0.2$) thin films deposited on (001) Al_2O_3 substrates. We show that the metal-insulator transition (MIT) of VO_2 is suppressed and the rutile structure is stable down to 100 K. The films are remarkably smooth having a root-mean squared (RMS) surface roughness of 0.3 nm. Films are conductive at room temperature and appear to follow a variable-range-hopping conduction mechanism below that. Ferromagnetism is observed at room temperature and is dependent on Cr concentration. The combination of these characteristics makes $V_{1-x}Cr_xO_2$ a viable candidate material for next generation spintronic multilayer devices.

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