Abstract Submitted
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Electric field-induced carrier accumulation at the vanadium dioxide-dielectric interface[1] K. MARTENS, ESAT KULeuven - IMEC - IBM Almaden, J.W. JEONG, UC Santa Barbara, N. AETUKURI, C. RETTNER, L. GAO, IBM Almaden, D.N. ESFAHANI, F.M. PEETERS, University of Antwerp, J. VAN DE VONDEL, V.V. MOSHCHALKOV, INPAC KULeuven, M. SAMANT, mgsamant@us.ibm.com, S.S.P. PARKIN, Stuart.Parkin@us.ibm.com — Classical rigid band semiconductors respond to an electric field at a dielectric interface by accumulating or depleting carriers at the interface. We investigate electrostatic field-effects in thin film devices formed from the prototypical, strongly-correlated insulator, vanadium dioxide VO_2. This material exhibits a temperature driven insulator to metal transition near room temperature. Therefore, non-trivial electric field driven electronic effects can be anticipated. We find that excess carriers can be introduced in our devices with concentrations of up to $\sim 5\text{x}10^{13}\text{cm}^{-2}$: these field induced carriers exhibit an activated low mobility at low temperatures that is characteristic of electron localization. Field-effect conductance modulation and depletion are highly inhibited with excess carriers confined near the interface. Signatures of defect-dominated scenarios are absent. The field-effect behavior that is exhibited by our VO_2 based devices is fundamentally different from that of a classical semiconductor.

[1]The FWO is acknowledged

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