Abstract Submitted
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Extraordinary Inhibition of the Field-effect by Bound Quasiparticles at the Interface of a Dielectric and the Metal-Insulator Transition Material VO_2[1] KOEN MARTENS, KULeuven / imec / IBM Almaden, JAE-WOO JEONG, NAGAPHANI AETUKURI, CHARLES RETTNER, IBM Almaden, NIKHIL SHUKLA, EUGENE FREEMAN, Penn State University, DAVOUD ESFAHANI, FRANCOIS PEETERS, Universiteit Antwerpen, TEYA TOPURIA, PHIL RICE, IBM Almaden, ALEXANDER VOLODIN, KULeuven, BENOIT DOUHARD, imec, WILFRIED VANDERVORST, imec / KULeuven, MAHESH SAMANT, IBM Almaden, SUMAN DATTA, Penn State University, STUART PARKIN, IBM Almaden — An electric field applied normal to the interface of a dielectric and the prototypical, strongly-correlated semiconductor VO_2 is anticipated to lead to non-trivial phenomena. This field-effect allows for key insight into VO_2 physics. Field-effect modulation of channel current and carrier depletion in a field-effect device are found to be extraordinarily highly inhibited and no Metal-Insulator Transition is induced by the gate field for excess carriers up to $5x10^{13}cm^{-2}$. The field-induced excess charge consists of bound quasi particles, as demonstrated by their activated and low excess carrier field-effect mobility. Small polarons as excess carriers in VO_2 consistently explain the observed field-effect, mobility and absence of depletion. The physics required to describe semiconducting VO_2's field-effect is fundamentally different from classical semiconductor physics.

[1]The FWO is acknowledged

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