

Correlated oxides for advanced electronics and energy devices

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We will consider new class of solid state devices for energy efficient electronics and electromagnetics that could potentially be enabled by ultrafast metal-insulator transitions in correlated oxides. Discussions will center around rutile (such as VO_2) and perovskite oxides (rare earth nickelates) that display sharp phase transitions above room temperature. The ability to reversibly collapse the band gap creates interesting opportunities in modulating not only electronic properties of the oxide materials being studied, but also as a means to screen electric fields in proximal structures. We will present experimental and simple device modeling results on electric field induced transitions and associated materials science. Studies on ionic gating of FET-like devices with correlated oxide channels will be discussed. Exotic effects with oxide heterostructures will be outlined. We will then consider exploratory energy conversion devices such as low temperature solid oxide fuel cells that may be realized with such phase transitions.