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De-coupling Electrical and Thermal Effects in Triggering Metal-Insulator Transition in VO_2 Thin Film Devices GOKUL GOPALAKRISHNAN, SHRIRAM RAMANATHAN, School of Engineering and Applied Science, Harvard University — Vanadium dioxide (VO_2) has been shown to undergo an abrupt electronic phase transition near $70^{\circ}C$ from a semiconductor to a metal, with an increase in dc conductivity of over three orders of magnitude, making it an interesting candidate for advanced electronics as well as for fundamental research into understanding the Mott transition. Recent experiments strongly suggest that this transition can be manifested independent of a structural phase transition in the system at a similar temperature, and that it can be triggered by the application of a critical field across the VO_2 thin film. To address the important question of thermal effects due to the applied field, we report the results of electro-thermal simulations on a number of common and promising device geometries showing the extent of heating caused by the leakage current in the "off" state of the VO_2 device. The simulation results are compared with experimentally observed device characteristics. Valuable insights into the nature of the metal-insulator transition can be obtained from such simulations and will be discussed in the presentation.

Gokul Gopalakrishnan
School of Engineering and Applied Science, Harvard University

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