

Abstract Submitted
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Metal-Insulator Transition in ultrathin CaVO_3 Films

MAN GU, JIWEI LU, STUART WOLF, University of Virginia — Bulk CaVO_3 (CVO) with a $3d^1$ electronic configuration has been found to exhibit metallic and Pauli paramagnetic behavior. We have synthesized epitaxial ultrathin films of CVO on single crystal (100) SrTiO_3 substrates by pulsed electron deposition. The CVO films were capped with 2.5nm SrTiO_3 layer. Compared with single crystal CVO, thin film CVO demonstrated very large resistance ratios (RR), e.g., $R(300\text{K})/R(2\text{K})$ more than 3000. The temperature dependent Hall measurement showed mostly that the large RR determined by the change in mobility, we observed the metal-insulator transition at $\sim 100\text{K}$ in CVO ultrathin films with thickness below 4nm, which was not observed in either thick CVO films or STO films. Above 100K, ultrathin CVO exhibited the metallic behavior, and below 100 K, it became an insulator. The emergence of MIT could be attributed to a pseudogap that appeared at Fermi surface with decreasing film thickness, indicating a transition from 3D metal to 2D insulator transition in ultrathin CVO films at temperatures lower than 100K. A metal-insulator transition was further characterized by I-V measurements, the insulator phase was only observed with driven current below 100K and $2 \times 10^{-6}\text{A}$.

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