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Theoretical study of electronic transport properties in pillar-embedded multiferroic transition-metal oxides[1] YUAN-YEN TAI, JIAN-XIN ZHU, Theoretical Division, Los Alamos National Laboratory, Los Alamos, New Mexico 87545, USA — Multiferroics show great potential in novel application to nanotechnologies based on well-established experimental techniques. Recently, vertically aligned nanocomposite (VAN) multiferroic thin films have demonstrated a significant amount of research interest owing to their promising results to give more delicate device, such as a larger interfacial area and intrinsic heteroepitaxy in this 3D structure. In order to understand the basic influence of the nano-pillar structure to the bulk multiferroics, we apply scaling theory to study the quasiparticle localization/delocalization effects of this novel nanostructure. Within an effective tight-binding model, we apply the transfer matrix method to calculate the wave function behavior throughout its transverse direction. We will show that how the critical behavior varies with various disordered nano-pillar patterns. We will also give a qualitative connection of our results to the transport experiments.

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