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Metal-insulator transitions in $LaTiO_3$ / $CaTiO_3$ superlattices[1]
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Strongly correlated electrons at an interface of complex oxide heterostructures often show interesting behaviors that require an introduction of new physical concepts. For example, the metallic transport behavior found in the superlattices of a Mott insulator $LaTiO_3$ and a band insulator $SrTiO_3$ (STO) has established the concept of interfacial electronic reconstruction. In this work, we have studied the transport property of a new type of Mott/band insulator $LaTiO_3/CaTiO_3$ (LTO/CTO) superlattices grown by pulsed laser deposition (PLD). In order to rule out concerns about the PLD plume-triggered oxygen vacancies generated in STO substrates, which might influence transport measurement, and to investigate the effect of epitaxial strain, we have used insulating $NdGaO_3$ substrates. While both LTO and CTO single films are highly insulating, we have observed intriguing metal-insulator transitions (MIT) in the LTO/CTO superlattices depending on the global LTO/CTO thickness ratio and temperature. (Note that LTO/STO superlattices are metallic at all temperatures (2-300 K)). In this talk, we will discuss the origin of the MIT in the scheme of self compensation mechanism of *d*-electrons at the hetero-interface between LTO and CTO.

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