

Optical Properties of $(\text{SrMnO}_3)_n/(\text{LaMnO}_3)_{2n}$ Superlattices: An Insulator-to-Metal Transition Observed in the Absence of Disorder

Monday, 23 July 2012 20:00 (2 hours)

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We measure the optical conductivity, $\sigma_1(\omega)$, of $(\text{SrMnO}_3)_n/(\text{LaMnO}_3)_{2n}$ superlattices (SL) for $n=1, 3, 5$, and 8 and $10 < T < 400$ K. Data show a T-dependent insulator to metal transition (IMT) for $n=3$, driven by the softening of a polaronic mid-infrared band. At $n=5$ that softening is incomplete, while at the largest-period $n=8$ compound the MIR band is independent of T and the SL remains insulating. One can thus first observe the IMT in a Manganite system in the absence of the disorder due to chemical doping. Unsuccessful reconstruction of the SL optical properties from those of the original bulk materials suggests that $(\text{SrMnO}_3)_n/(\text{LaMnO}_3)_{2n}$ heterostructures give rise to a novel electronic state.

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Session Classification: Poster Session 1

Track Classification: Metal-Insulator Systems