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Optical Properties of (SrMnO3)n/(LaMnO3)2n Superlattices: An Insulator-to-Metal Transition Observed in the Absence of Disorder

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We measure the optical conductivity, $\sigma 1(\omega)$, of (SrMnO3)n/(LaMnO3)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 (SrMnO3)n/ (LaMnO3)2n heterostructures give rise to a novel electronic state.

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