Max Planck Research Department for

Structural Dynamics

SEMINAR

November 21st, 2011 - 14:30 pm

Seminar Room 108, DESY Bldg. 49

Andrea Perucchi

ELETTRA Synchrotron, Trieste, Italy

Optical Properties of $(SrMnO_3)_n/(LaMnO_3)_{2n}$ Superlattices: An Insulator-to-Metal Transition Observed in the Absence of Disorder

We measure the optical conductivity, $\sigma_1(\omega)$, of $(SrMnO_3)_n/(LaMnO_3)_{2n}$ 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 $(SrMnO_3)_n/(LaMnO_3)_{2n}$ heterostructures give rise to a novel electronic state.

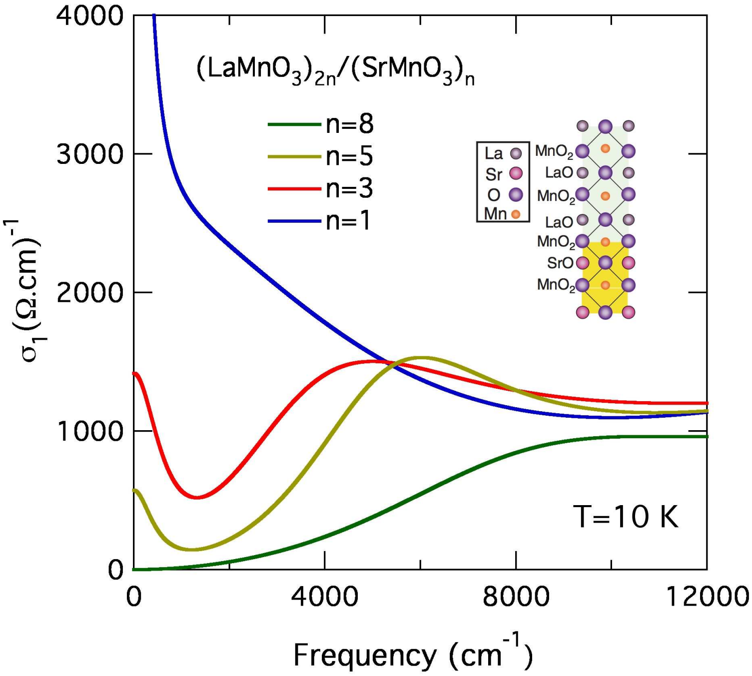

Figure: $\sigma_1(\omega)$ at T =10 K, for the n=1, 3, 5, 8 compounds, showing a Mott transition induced by the proximity between the layers. From A. Perucchi et al., Nano Letters 10, 4819 (2010).

Host: Andrea Cavalleri, Condensed Matter Division, MPSD, CFEL