

The FIR c-axis Conductivity of Charge-Ordered PrSr₂Mn₂O₇ by Ellipsometry

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Results: The far-infrared conductivity (σ_1) of the layered CMR (colossal magneto-resistance) manganite, PrSr₂Mn₂O₇, which exhibits charge ordering and antiferromagnetism below 125K, was measured along the c-axis direction of a single crystal by FT-IR ellipsometry. Fig. 1 shows σ_1 at various temperatures, which exhibits three phonon modes, the least energetic being split. There is little temperature dependence of the far-infrared conduction beyond the expected anharmonic phonon broadening and softening with increasing temperature.

A previous ellipsometric measurement of σ_1 from the ab plane of the same crystal revealed some unusual far infrared features. These were found to be due to anisotropy in the sample. Due to the grazing incidence and polarisation of the probing light a significant component of the electric field vector is perpendicular to the surface, exciting a dielectric response from the c-axis. The reflected signal thus contains a mixture of c-axis and ab plane responses. In order to reduce this mixed response to find the exclusively ab plane conductivity it is necessary to also measure the reflectance of the c-axis. A reduction of these two measurements using the Fresnel equations then enables us to find the principal ab plane dielectric component. Thus, though an unexciting spectrum, the c-axis conductivity for PrSr₂Mn₂O₇ was a vital ingredient for determining σ_1 of the ab plane.

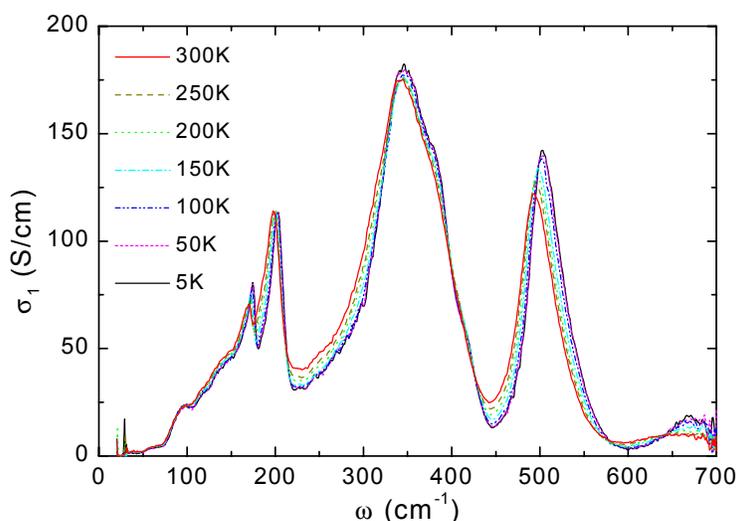


Figure 1. Temperature dependence of the c-axis conductivity of PrSr₂Mn₂O₇.