Charge dynamics in the normal state of the iron oxypnictide superconductor LaFePO¹

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Many-body interactions in materials govern diverse and complex phenomena like high-$T_c$ superconductivity, density wave instabilities and metal-insulator transitions. Infrared spectroscopy is an ideal tool for identifying the fingerprints of the various interactions in a material. We present infrared and optical properties in the normal state of $ab$-plane oriented single crystals of the iron oxypnictide superconductor LaFePO. Prominent Drude peaks and low scattering rates indicate the presence of coherent quasiparticles. We find that this metal has a relatively low carrier density compared to MgB₂, for example. An important result is that the Drude spectral weight i.e. the kinetic energy of itinerant quasiparticles is reduced by correlation effects to 50% of the band theory value. Even though LaFePO is among the most conducting of the iron-pnictides, we find that electronic correlations cannot be ignored in any realistic physical description of this material. We classify LaFePO as a moderately correlated metal.

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