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Formation of As-As bond and its effect on absence of superconductivity in the collapsed tetragonal phase of $\text{Ca}_{0.86}\text{Pr}_{0.14}\text{Fe}_2\text{As}_2$: An optical spectroscopy study RUN YANG, XIANGGANG QIU, Institute of Physics, Chinese Academy of Sciences, INSTITUTE OF PHYSICS, CHINESE ACADEMY OF SCIENCES TEAM, HIGH MAGNETIC FIELD LABORATORY, CHINESE ACADEMY OF SCIENCES TEAM — The temperature dependence of in-plane optical conductivity has been investigated for $\text{Ca}_{0.86}\text{Pr}_{0.14}\text{Fe}_2\text{As}_2$, which shows a structural transition from tetragonal (T) to collapsed tetragonal (cT) phase at $T_{cT} \sim 73$ K. Upon entering the cT phase, drastic change characterized by the formation of a midinfrared peak near 3200 cm^{-1} (0.4 eV) in the optical conductivity is observed. Analysis of the spectral weight reveals reduced electron correlation after the cT phase transition. Based on the calculated band structure and simulated optical conductivity, we attribute the new feature around 0.4 eV to the formation of an interlayer As-As bond. The As-As bond strongly affects the Fe-As hybridizations and, in turn, drastically changes the $\text{Ca}_{0.86}\text{Pr}_{0.14}\text{Fe}_2\text{As}_2$ into a nonmagnetic Fermi liquid system without bulk superconductivity in the cT phase.

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