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Spin-density-waveinduced anomalies in the optical conductivity of AFe2As2, (A=Ca, Sr, Ba)[1] ALIAKSEI CHARNUKHA[2], DANIEL PROEPPER, TIMOFEI LARKIN, DUNLU SUN, Z.W. LI, CHENGTIAN LIN, Max Planck Institute for Solid-State Research Stuttgart, THOMAS WOLF, Institute for Solid-State Physics, Karlsruhe Institute of Technology, BERNHARD KEIMER, ALEXANDER BORIS, Max Planck Institute for Solid-State Research Stuttgart — We report the complex dielectric function of high-quality AFe2As2, (A=Ca,Sr,Ba) single crystals with TN=150K, 200K, and 138K, respectively, determined by broadband spectroscopic ellipsometry. In CaFe2As2 we identify the optical spin-density–wave gap $2\Delta_{\mathrm{SDW}} \approx 1250$ cm^{-1}. The $2\Delta_{\mathrm{SDW}}/(k_{\mathrm{B}}T_{\mathrm{N}})$ ratio amounts to 12 in CFA, significantly larger than the corresponding values for the SFA and BFA compounds: 8.7 and 5.3, respectively. We further show that, similarly to the Ba-based compound, two characteristic SDW energy gaps can be identified in the infrared-conductivity spectra of both SFA and CFA and investigate their detailed temperature dependence in all three materials. This analysis reveals the existence of an anomaly in CFA at a temperature T*=80K, well below the Néel temperature of this compound, which implies weak coupling between the two SDW subsystems. The coupling between the two subsystems evolves to intermediate in the Sr-based and strong in the Ba-based material. Our results single out CFA in the class of 122 iron-based materials by demonstrating the existence of two weakly coupled and extremely metallic electronic subsystems.

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