Charge Dynamics in SDW state of $A\mathrm{Fe_2As_2}$

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After the discovery of iron-pnictde superconductors, numerous research activities have been done all over the world. In almost cases, superconductivity in iron pnictides appears by suppressing antiferromagnetic ordering (SDW). To clarify the electronic structure in the SDW state of iron pnictides, we have investigated the transport and optical properties using single crystals of $A\mathrm{Fe_2As_2}$ (A = Ba, Eu, Sr), and Co-doped $\mathrm{BaFe_2As_2}$ with the SDW transition temperature, T_{SDW} = 100 K-197 K.
In $A\mathrm{Fe_2As_2}$, the resistivity has a sudden change at T_{SDW}, and shows a metallic behavior even below T_{SDW}. On the other hand, the absolute values of Hall coefficient are clearly enhanced below T_{SDW}, indicating the decrease of carrier numbers. The optical reflectivity is suppressed in far-infrared region below T_{SDW}, but it approaches to unity at zero frequency, which indicates a metallic behavior even in magnetically ordered state. The low-energy conductivity is severely suppressed and the spectral weight transfers from low to high energy region, indicating the open of SDW gap. In the mid-infrared region, the optical conductivity has two peak structures in the SDW state. These peak energies scale with T_{SDW}, suggesting that the observed peaks originate from the SDW gap. All these results have revealed the electronic state of $A\mathrm{Fe_2As_2}$ where the two SDW gaps open partially at the Fermi surface.