Anisotropic optical spectrum of detwinned $Ba(Fe_{1-x}Co_x)_2As_2$

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An anisotropic electronic state emerging in undoped and underdoped compounds of iron-arsenide superconductors has attracted much interest as the proximate phase to the superconducting phase. To understand the physics of iron-based superconductors, it is important to investigate the electronic properties in this phase. Since free-standing crystals have a twinned structure, which hinders us from observing the genuine anisotropic properties, experiments using detwinned single crystals should be carried out.
We performed optical spectroscopy on the mechanically detwinned $Ba(Fe_{1-x}Co_x)_2As_2$ crystals. For the parent compound, in the low-temperature orthorhombic-antiferromagnetic phase, low-energy optical conductivity along the longer a axis is larger than that along the shorter b axis, and the anisotropy is reversed in the high-energy region.[1] Such anisotropy arises from anisotropic gap opening. We will present how the anisotropic spectrum evolves with Co doping to explain the enhanced anisotropy in the dc resistivity of the Co-doped compounds.

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