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Study of Optical Properties in Triple-Layer Cuprate Bi2223

*Yuta Ito[1], Katsuya Mizutamari[1], Masamichi Nakajima[1], Nae Sasaki[2], Shunpei Yamaguchi[2], Takao Watanabe[2], Shigeki Miyasaka[1], Setsuko Tajima[1]

Department of Physics, Osaka University, Osaka 560-0043, Japan[1]
Graduate School of Science and Technology, Hirosaki University, Hirosaki 036-8561, Japan[2]

$Bi_2Sr_2Ca_2Cu_3O_{10}$, "Bi2223", which is one of the multilayer cuprate superconductors, has three CuO_2 layers per unit cell. The optimally doped Bi2223 shows the superconductivity below T_c = 110K. Recently the superconducting gap in each layer has been determined by angle-resolved photoemission[1] and Raman scattering spectroscopy[2]. The observed gap sizes and the gap/T_c ratio were much larger than those of single- and double-layer cuprates.

Because of this relatively higher T_c and larger superconducting gap, it is expected that the change of the optical feature by superconducting transition appears at higher energy region and at higher temperatures above T_c. However, there has been so far no report of optical spectra of Bi2223 probably because of a lack of large crystals. In this work, we performed in-plane ($E \perp c$) optical reflectivity measurements by Fourier transform infrared (FTIR) spectroscopy in optimally doped Bi2223. We succeeded in observing a rise of reflectivity below T_c around 1000 cm^{-1}, suggesting the suppression of the optical conductivity with forming Cooper pairs.

[1] S. Ideta, *et al.*, Phys. Rev. Lett. **104**, 227001 (2017)
[2] G. Vincini, *et al.*, Phys. Rev. B **98**, 144503 (2019)

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