Anisotropic Drude response in Mg(B$_{1-x}$C$_x$)$_2$ TERUHISA KAKESHITA, SERGEY LEE, SRL-ISTEC, SETSUKO TAJIMA, Osaka University, SRL-ISTEC TEAM, OSAKA UNIVERSITY COLLABORATION — There exists an unsolved issue on MgB$_2$ that a plasma edge estimated from optical spectra so far is conspicuously inconsistent with a band calculation. It is mysterious since experimental band dispersions by ARPES are marvelously coincident with the band calculation. We report on a- and c-axis optical responses in Mg(B$_{1-x}$C$_x$)$_2$ using small single crystals and a FTIR spectrometer combined with an optical microscope. It was verified that the Drude responses show the anisotropy between a- and c-axis. The observed plasma frequencies $\omega_p'$ are considerably small compared to a theoretical value ($\sim$7eV), whereas the bare ones $\omega_p$, estimated from a sum rule of optical conductivity $\int d\omega \sigma(\omega) = (\pi/2)\omega_p^2 = (\pi/2)\epsilon_\infty \omega_p'^2$, are fairly coincident with it. We also discuss an effect of carbon-substitution on carrier concentration and scattering rate in a multiband system. This work was supported by the New Energy and Industrial Technology Development Organization (NEDO) through ISTEC as the Collaborative Research and Development of Fundamental Technologies for Superconductivity Applications.

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