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Polarized micro Raman spectroscopy of bilayer graphene HYERIM MOON, DUHEE YOON, Department of Physics, Sogang University, Seoul 121-742, Korea, YOUNG-WOO SON, Korea Institute for Advanced Study, Seoul 130-722, Korea, HYEONSIK CHEONG, Department of Physics, Sogang University, Seoul 121-742, Korea — The frequency of Raman $2D$ band of the graphite depends on the excitation laser energy. This phenomenon is explained with double resonance Raman process. In polarized micro-Raman spectroscopy of single layer graphene, Raman G band ($\sim$1586 cm^{-1}) is isotropic, and $2D$ band ($\sim$2686 cm^{-1}) strongly depends on relative polarizations of the incident and scattered photons. This strong polarization dependence originates from inhomogeneous optical absorption and emission mediated by resonant electron-phonon interaction. In bi-layer graphene, Raman $2D$ band can be decomposed into four Lorenztian peaks which can be interpreted in terms of the four transition paths in the double resonance Raman process. We investigated the polarization dependence of each Lorenztian peak in the Raman $2D$ band of bi-layer graphene for different excitation laser energies. Strong polarization dependence of the Raman $2D$ band, similar to the case of single layer graphene, is observed. The excitation energy dependence of the polarized Raman scattering is analyzed in terms of the band structure of bi-layer graphene.

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