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Selection rule for Raman spectroscopy at graphene edge KEN-ICHI SASAKI, KATSUNORI WAKABAYASHI, National Institute for Materials Science, TOSHIAKI ENOKI, Department of Chemistry, Tokyo Institute of Technology — The optical matrix element may depend on position in graphene since an electronic wave function is position dependent. In particular, the matrix element near the edges of graphene can differ greatly from that in the bulk. We are pursuing our studies on this point in relation to Raman spectroscopy. We found a selection rule for the G band near the edges of graphene: the intensity is enhanced when the polarization of incident laser is parallel (perpendicular) to the armchair (zigzag) edge [1]. This asymmetry between the armchair and zigzag edges is useful in identifying the orientation of the edge of graphene. Some application of the selection rule is mentioned. We have extended our study to the polarization dependences of the D and 2D (G') bands [2]. The D and 2D bands have different selection rules at bulk and edge. At bulk, the 2D band intensity is maximum when the polarization of the scattered light is parallel to that of incident light, whereas the D band intensity does not have a polarization dependence. At edge, the 2D and D bands exhibit a selection rule similar to that of the G band.

[1] Sasaki et al., J. Phys. Soc. Jpn. 79, 044603 (2010).

[2] Sasaki et al., Phys. Rev. B 82, 205407 (2010).

Ken-ichi Sasaki
National Institute for Materials Science

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