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Optical Field Enhancement by Semiconducting Graphene Nanoribbons[1] YOSHIYUKI MIYAMOTO, AIST, Japan, HONG ZHANG, Sichuan University, China — Graphene nano-ribbons are known to have energy gap depending on direction of ribbon edge and ribbon width having optical property different from that derived from Dirac cone of the graphene. When the edges are in armchair direction, the ribbons are semiconducting with energy gaps at their Γ points. In this presentation, we report an enhancement of an optical electric field (E-field) by an armchair graphene nano-ribbon by means of the first-principles simulation. The polarization of the E-field was set as parallel to the graphene sheet and perpendicular to ribbon axis. By performing the time-dependent density functional theory (TDDFT) simulation under dynamical E-field, an enhancement of E-field was seen with optical frequencies near the resonance of absorption peaks of the nano-ribbon. The enhancement was not persistent but showed an amplitude modulation with frequencies of few (tens) terahertz depending on E-field frequencies. In this presentation, we discuss mechanisms of field-enhancement and possible applications.

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