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Investigating photoresponse in graphene by light polarization[1] M. EGINLIGIL, B.C. CAO, Z.L. WANG, C. SOCI, T. YU, Nanyang Technological University — We report our photocurrent studies on single layer graphene (SLG), bilayer graphene (BLG) and trilayer graphene (TLG) by exciting with circularly polarized light. In addition to p-n junctions based on gated graphene field-effect-transistor (g-FET), it was recently demonstrated that in the graphene/metal interface large photocurrent (PC) can be generated and this PC can be manipulated by backgate voltage in a simple g-FET. In this work we fabricated g-FETs from mechanically exfoliated graphene and explored backgate voltage dependence of photon drag effect (PDE), linear and circular photogalvanic effect (CPGE) of SLG, BLG and TLG. In BLG, we noticed a $\cos\theta$ dependence of the measured PC, where θ is the angle of incident light polarization, in addition to PDE and CPGE effects which have $\cos4\theta$ and $\sin2\theta$ dependence, respectively. This $\cos\theta$ dependence is attributed to the Berry curvature related valley PC, which can be induced as a result of broken inversion symmetry and asymmetry in the two low energy valleys of BLG. The latter is absent in SLG and peculiar for ABA stacked TLG. By varying backgate voltage we distinguish all helicity dependent PC contributions. Our data show good agreement with the theory.

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