Manipulating light flow with 2D plasmonics

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Abstract

Polaritonic resonances in the family of 2D materials [1] can offer new and exciting opportunities in control of light flow, both in the near- and far-field regime. I will begin by discussing how atomically thin metasurface made from various 2D materials can enable the control of scattered phase and polarization, enabling functionalities like tunable waveplates, cloaking, illusion, focusing and beam forming [2-4]. Next, I will discuss how one can control plasmon flow through its temporal modulation [5]. When the modulation is on the timescale of the plasmonic period, we show it is possible to create a backward propagating or standing plasmon wave, and to amplify the plasmons. In AB-stacked bilayer graphene with a tunable electronic bandgap in excess of the optical phonon energy, it could present interesting active medium. We argue the possibility of a highly resonant optical gain near the asymmetry gap [6]. Associated with this resonant gain are strongly amplified plasmons, plasmons with negative group velocity and superluminal effects, as well as directional leaky modes.

References

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