

2D materials plasmons: physics and applications

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Recent years have observed a plethora of strong dipole type polaritonic excitations in 2D materials owing to the reduced screening. These polaritons can be sustained as electromagnetic modes at the interface between a positive and negative permittivity material. In this talk, I will discuss our recent efforts in understanding plasmons behavior in various 2D materials, such as graphene, black phosphorus, and transition metal dichalcogenides, and how these systems can also exhibit rich transport behavior, such as hyperbolic rays, non-reciprocal chiral propagation, and time reversal of waves. Lastly, I will discuss key applications where graphene plasmonic are uniquely suited; graphene for the manipulation of mid-infrared beam, gas and biosensing.

[1] Low, T., Chaves, A., Caldwell, J.D., Kumar, A., Fang, N.X., Avouris, P., Heinz, T.F., Guinea, F., Martin-Moreno, L. and Koppens, F., 2017. Polaritons in layered two-dimensional materials. *Nature materials*, 16(2), pp.182-194.

[2] Low, T. and Avouris, P., 2014. Graphene plasmonics for terahertz to mid-infrared applications. *ACS nano*, 8(2), pp.1086-1101.

[3] Avouris, P., Heinz, T.F. and Low, T. eds., 2017. *2D Materials*. Cambridge University Press.