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Coupled exciton- surface plasmon polariton enhanced photoresponse of 2D hydrogenated SiB

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Exciton (strong electron-hole interactions) and Hot Carriers (HC) created by surface plasmon polaritons enhance the photo response of nano-electronic and optoelectronic devices. In the current research, we developed a quantum framework to study coupled exciton-HCs effects on the photovoltaic energy distribution, scattering process, polarizability and light emission of 2D-semicnductors. We show that the strain and thermal effect on the Two-Dimensional (2D) semiconductors can lead to valley polarized plasmon Quasi Particles (QP) and HC generation. Our results reveal that the electron-phonon (e-ph) and electron-electron (e-e) interactions characterize the correlation between the decay rates, scattering of excitons and generation of HCs in 2D semiconductors. Moreover, phonon assisted luminescence spectra indicate that light emission can be enhanced by increasing strain and temperature. Here, we introduce a promising stable 2D H-SiB semiconductor with engineering the elastic strain, creating a broad range of absorption spectrum (solar light capture), which concentrates plasmon resonances and polarized plasmon QP, constituting strong coupling of electronic and photonics states, which makes it as a promising candidate for light harvesting, plasmonic photocurrent devices and quantum information.

Biography

Farzaneh Shayeganfar supervises the experimental and computational design of emerging materials research group is a part of the Department of Physics at Polytechnic. Her goal is to better design high quality functional materials by mapping the relationship between materials structures and their physical and chemical properties through a combined theoretical and experimental approach. Her group integrates all the aspects of materials research from developing the fundamental understanding to the design, synthesis and testing of new bulk and nanomaterials. They combine computational approaches in quantum mechanics, solid-state physics and statistical mechanics, with selected experiments into a complimentary research strategy to investigate materials in the energy field.

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