

광과학 분과 Online Lecture Series

One-dimensional quantum plasmons and their applications



Prof. SeokJae Yoo Inha University, Physics

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Squeezing electrons into low dimension introduces strong quantum effects, resulting in unique properties that cannot be found in higher-dimensional counterparts. Electrons in one-dimensional (1D) metals are no longer quasi-free particles, but they behave collectively as a strongly correlated quantum matter, namely, a Luttinger liquid. The quantum plasmons in 1D exhibit intriguing electrical and optical properties: the spin-charge separation, the power-law scaling of tunneling conductance, and the forbidden backscattering of plasmons. These quantum properties are not only of fundamental interest but also have a great potential for electro-optical applications. In this talk, we review the fundamentals of the Luttinger liquid and the experimental observation. We also introduce our recent works on the Luttinger liquid plasmons: (1) electrically tunable optical plasmons in mixed dimensional van der Waals heterostructures and (2) the Luttinger liquid-based infrared light-emitting devices.

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Gate-tunable plasmons in mixed-dimensional van der Waals heterostructures

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