Enhancement of Optical Nonlinearities in 2D Materials

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Nonlinear optics plays an essential role in various photonic and optoelectronic applications, such as wavelength conversion and information processing. Recently, the extraordinarily large nonlinear optical properties of 2D materials have attracted significant attention. However, the conversion efficiency of 2D materials is typically limited by the atomically thin light-matter interaction length. Here, I will discuss the strategies to enhance optical nonlinearities of two-dimensional layered materials (e.g., graphene, transition metal dichalcogenides) for various integrated photonic and optoelectronic applications, such as high-purity quantum emitters, wavelength converters, and ultrafast lasers. I will also present our recent results of employing hybrid structures, such as mixed-dimensional heterostructures, plasmonic structures, and silicon/fibre waveguides integrated structures.

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