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Control of light-matter interaction in van der Waals materials

Abstract
Two-dimensional (2D) van der Waals materials have emerged as a very attractive class of optoelectronic material due to the unprecedented strength in its interaction with light. In this talk I will discuss approaches to enhance and control this interaction by integrating these 2D materials with microcavities, and metamaterials. I will first discuss the formation of strongly coupled half-light half-matter quasiparticles (microcavity polaritons) [1] and their spin-optic control [2] in the 2D transition metal dichacogenide (TMD) systems. Following this I will discuss the formation of polaritons using excited states (Rydberg states) to enhance the nonlinear polariton interaction. Recent results on electrical control [3] and realization of a polariton LED based on 2D TMDs [4] will also be presented. Finally, I will talk about strain activated room temperature single photon emission from hexagonal boron nitride (hBN) [5] which can be integrated with microresonators on silicon photonic platform.

References

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