Photonic crystals made from quasi-bulk WS2 as a new tunable platform for photonics: from polaritons to topological edge states

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For over a decade, layered crystals, dubbed van der Waals materials, have attracted tremendous interest due to their unique properties in their single and few layer regime. Recently, bulk van der Waals (vdW) materials have also attracted closer attention for their potential as building block for nanophotonics thanks to their attractive optical properties such as large transparency windows in the visible and near-infrared, large refractive indexes, and high-oscillator-strength excitons [1]. The weak out-of-plane van der Waals adhesive forces makes them compatible with various substrates and enable the fabrication of previously inaccessible photonic structures due to their ability to be stacked layer by layer. We present here 1D (figure 1a)and 2D (figure 2a) photonic crystals made of exfoliated WS2 flakes as a new highly tunable and versatile platforms for observation of strong light-matter interactions and of topological edge states. Other devices using heterointegration with other materials will also be discussed.

References

[1] P.G. Zotev, Y. Wang, D. Andres-Penares, et al. Laser Photonics Rev.,17, (2023), 2200957

Figures

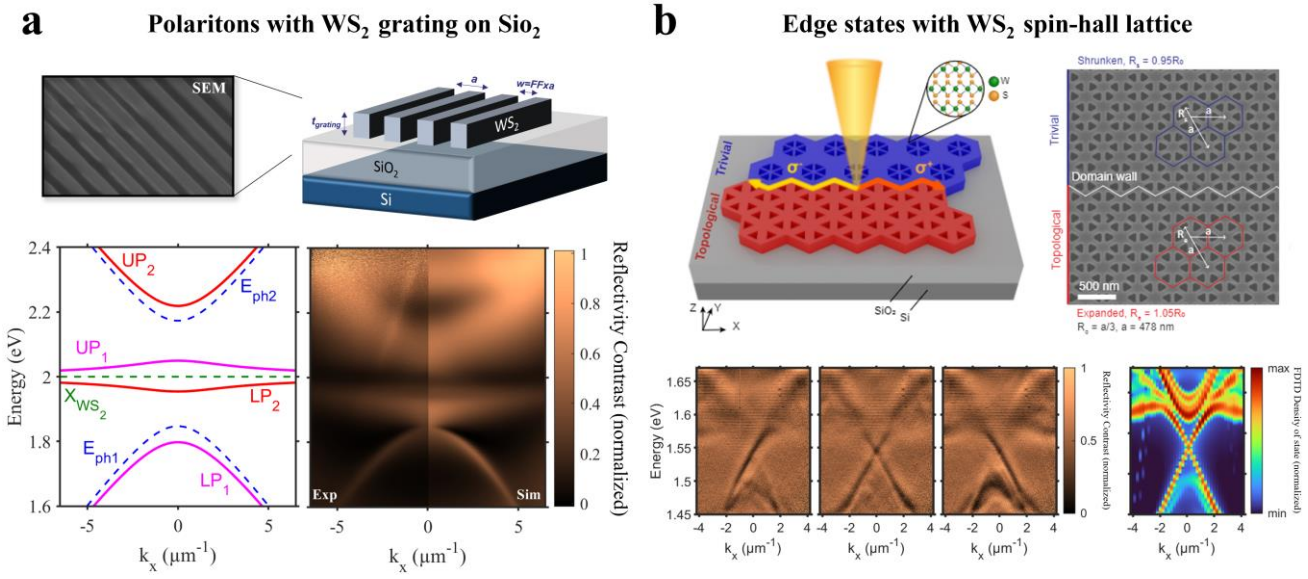

Figure 1: 1D and 2D photonic crystals made of exfoliated WS2 flakes as a new highly tunable and versatile platforms for observation of strong light-matter interactions in 1D gratings (a) and of topological edge states in topological lattices (b).