Manipulating the ultrafast dynamics of exciton polariton condensates in halide perovskite microcavities

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Recently, microcavity exciton polariton research has attracted considerable interests in a number of excellent optical gain materials that demonstrate unique properties compared with conventional III-V or II-VI semiconductor quantum wells and organic semiconductors. Those materials include transition metal dichalcogenides (TMDs), and certain halide perovskite semiconductors. Particularly, those materials exhibit large exciton binding energies (much larger than thermal fluctuation energy ~ 26 meV), large oscillator strength and peculiar electronic band structures such as valley polarization or encoded chiroptical responses. In this talk, we will discuss our recent effort in manipulating exciton polariton condensates in halide perovskite semiconductors microcavities, for instance demonstration of room-temperature optical spin Hall effect in planar microcavities and the characterization of ultrafast propagation of polariton in 1D waveguide structures. Next we will discuss the neuromorphic computing based nonequilibrium dynamics, the highly nonlinear nature enables 92% accuracy in benchmarking digit recognition with single-step training. Finally, we will conclude the talk with some perspective outlooks.

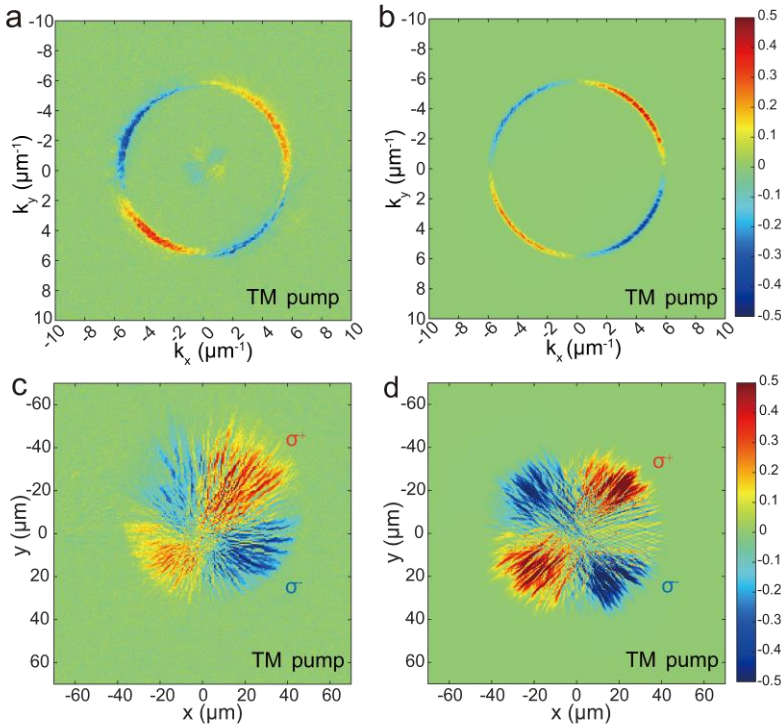

Figure 1: Room-temperature optical spin Hall effect in halide perovskite microcavities.

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