Optically Induced Interlayer Exciton Traps in $MoSe_2$/WSe_2 Heterostructures by Laguerre-Gaussian excitation

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Long-lived quasiparticle excitations, such as interlayer excitons in $MoSe_2$ / WSe_2 heterostructures, constitute a promising platform for exploring many-body physics in a two-dimensional solid-state system. Introducing a trapping potential facilitates exploration of the excitonic many-body regime by providing a platform for controlling the density of the interlayer exciton ensemble despite their strong repulsive electrical dipole moment. So far, exciton traps have been realized with the help of electrostatic gates [1, 2, 3] and local strain profiles [4, 5] as well as by utilizing moiré potentials [6].

In this work, we demonstrate the enhanced luminescence from interlayer excitons in $MoSe_2$ / WSe_2 heterostructures confined by a Laguerre-Gaussian excitation scheme. Long luminescence lifetimes and high lateral expansion of the excitons allow for the investigation of exciton ensembles at high densities without the direct influence of temperature, excess charge carriers, and laser-induced coherence. We show hyperspectral images of the emitted photoluminescence, discuss the relative intensity and linewidth inside and outside this optical trap, and compare the scheme to the excitation with a Gaussian mode [7].

Acknowledgments

We gratefully acknowledge financial support from the Deutsche Forschungsgemeinschaft (DFG) via project HO 3324 / 16-1 and the clusters of excellence MCQST and e-conversion.

References

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