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Optical properties of monolayer MoS_2 nanoribbons[1] GUOHUA WEI, Applied Physics Program, Northwestern University, ERIK J. LENFERINK, NATHANIEL P. STERN, Department of Physics and Astronomy, Northwestern University — Confinement of carriers in semiconductors is a powerful mechanism for manipulating optical and electronic properties of materials. Although atomically-thin monolayer semiconductors such as transition metal dichalcogenides naturally confine carriers in the out-of-plane direction, achieving appreciable confinement effects in the in-plane dimensions is less well-studied because their optical processes are dominated by tightly bound excitons. In earlier work, we have shown that lateral confinement effects can be controlled in monolayer MoS_2 using high-resolution top-down nanopatterning[2]. Here, we use similar techniques to create monolayer MoS_2 nanoribbons that exhibit size-tunable photoluminescence and anisotropic Raman scattering. Our process also allows characterization of transport properties of the nanoribbons. This approach demonstrates how dimensionality influences monolayer semiconductors, which could impact charge and valley dynamics relevant to nano-scale opto-electronic devices.

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[2]G. Wei, D. Czaplewski, E. Lenferink, T. Stanev, I. Jung, N. Stern. arXiv:1510.09135

Guohua Wei
Applied Physics Program, Northwestern University

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