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Excitons bound to stacking fault planes in GaAs: a novel 2D excitonic system[1] TODD KARIN, XIAYU LINPENG, SARAH HARVEY, University of Washington, ARNE LUDWIG, ANDREAS WIECK, Ruhr-Universitaet Bochum, KAI-MEI FU, University of Washington — This work takes a first step in characterizing the unique optical properties of stacking fault defects in GaAs grown by molecular beam epitaxy. We observe narrow-band bright luminescence from carriers bound to the attractive strain potential formed by a stacking fault. The strong radiative emission is concentrated in two narrow bands ($\sim 90\ \mu$eV width) at either 828.65 or 830.40 nm depending on the stacking fault orientation. Stacking fault defects can be imaged using far-field confocal microscopy by collecting the the narrow band photoluminescence. Polarization-resolved photoluminescence and magnetic field measurements are consistent with a theory of light-hole excitons bound to the stacking fault plane with a quantization axis normal to the plane. Moreover, the wavelength shift of the excitonic emission provides a direct measure of the strain potential due to this fundamental growth defect. The narrow linewidth and high homogeneity across many defects suggests excitons are bound to a single atomically-thin stacking fault plane. This work opens the door to a novel, highly homogeneous, 2D light-hole excitonic system in the well-characterized material GaAs.

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