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Single Quantum Emitters in Monolayer Tungsten Diselenide GENEVIEVE CLARK, JOHN SCHAIBLEY, University of Washington, YU-MING HE, YU HE, M. C. CHEN, Y. J. WEI, X. DING, QIANG ZHANG, JIAN-WEI PAN, University of Science and Technology of China, WANG YAO, University of Hong Kong, CHAOYANG LU, University of Science and Technology of China, XIAODONG XU, University of Washington — Single quantum emitters (SQE's) are central to emerging photonic quantum technologies. While they have been realized in a variety of solid state systems, all solid-state quantum emitters to date are embedded in a three dimensional bulk matrix. We present a new type of single quantum emitter in a two-dimensional system, in the form of neutral excitons localized to defects within atomically thin tungsten diselenide monolayers. These localized excitons show strong photoluminescence with 130 ueV emission lines from two non-degenerate, cross-polarized transitions. Their narrow line width is characteristic of localized exciton emission, and is several orders of magnitude narrower than seen from excitons delocalized in a monolayer. Second-order correlation measurements show strong photon anti-bunching, establishing that these localized excitons are single photon emitters. Magneto-optical measurements reveal an exciton g-factor of 8.7, significantly larger than that of delocalized excitons. SQE's in monolayer WSe_2 may offer practical advantages such as efficient photon extraction and scalability, and in-situ control of local environment.

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