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Tunable room-temperature single photon emission from atomic defects in hexagonal boron nitride GABRIELE GROSSO, HYOWON MOON, BENJAMIN LIENHARD, DMITRI EFETOV, MARCO FURCHI, PABLO JARILLO-HERRERO, Massachusetts Inst of Tech-MIT, SAJID ALI, MICHAEL FORD, IGOR AHARONOVICH, University of Technology Sydney, DIRK ENGLUND, Massachusetts Inst of Tech-MIT — Two-dimensional van der Waals materials have emerged as promising platforms for solid-state quantum information processing devices with unusual potential for heterogeneous assembly. Recently, bright and photostable single photon emitters were reported from atomic defects in layered hexagonal boron nitride (hBN), but controlling inhomogeneous spectral distribution and reducing multi-photon emission presented open challenges. We demonstrate that strain control allows spectral tunability of hBN single photon emitters, and material processing sharply improves the single-photon purity. Our sample fabrication process relies on ion irradiation and high temperature annealing to isolate individual defects for single photon emission. Spectroscopy on this emitter reports high single photon purity of $g^{(2)}(0)=0.07$, and high count rates exceeding 10^7 counts/sec at saturation. Furthermore, these emitters are stable to material transfer to other substrates, including a bendable beam that allows us to controllably apply strain. Our experiments indicate a maximum tuning of 6 meV and emission energy dependencies ranging from -3 to 6 meV/%. High-purity and photostable single photon emission at room temperature, together with spectral tunability and transferability, opens the door to scalable integration of high-quality quantum emitters in photonic quantum technologies.

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