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High-quality blue quantum emitters in hexagonal boron nitride without background fluorescence.

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Single-photon sources in wide-band gap hexagonal boron nitride (hBN) hold great promise for applications in quantum communication and quantum key distribution. However, the production of high-quality quantum light sources in hBN remains a challenge. In this work, we focus on fabricating blue quantum emitters (near 436 nm) via electron bombardment, combined with thermal annealing and plasma treatment to effectively eliminate background fluorescence. By removing surface contaminants that previously caused spectral interference, we achieve stable and clean quantum dots. Polarization-resolved photoluminescence measurements further demonstrate excellent crystal alignment. Our findings are crucial for advancing defect engineering and practical applications of quantum optical technologies.

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