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A High-Purity Single Photon Emitter in Aluminum Nitride BENJAMIN LIENHARD, TSUNG-JU LU, KWANG-YONG JEONG, HYOWON MOON, AVA IRANMANESH, GABRIELE GROSSO, DIRK ENGLUND, Massachusetts Institute of Technology — Highly efficient, on-demand, and robust single photon emitters (SPEs) are essential to many areas of quantum information processing. Over the past decade, color centers in solids have emerged as excellent SPEs and have also been shown to provide optical access to internal spin states. Color centers in diamond and silicon carbide are among the most intensively studied SPEs. Recently, other cost-efficient wide-bandgap materials have become attractive as potential host materials. Theoretical calculations show that aluminum nitride (AlN) with a bandgap of 6.015 eV can serve as a stable environment for well isolated SPEs with optically accessible spin states. Here, we report on a room-temperature SPE that emits in the visible spectrum. The SPEs are hosted by AlN thin-films on sapphire substrates. Annealing treatments enable the control of their photostability and density. These SPEs are highly efficient and emit single photons up to 95% purity. The presence of high-purity SPEs, along with the good optomechanical properties, makes AlN a promising candidate for quantum information processing.

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