Abstract Submitted
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Epitaxial deposition of highly enriched ^{28}Si films with <1 nm roughness K. J. DWYER, HYUN-SOO KIM, A. N. RAMANAYAKA, D. S. SIMONS, VLADIMIR OLESHKO, J. M. POMEROY, National Institute of Standards and Technology — Low temperature epitaxial deposition of thin films with less than 1 nm rms roughness is achieved using a ^{28}Si ion beam deposition source. These films are enriched *in situ* to <140 ppb ^{29}Si isotope fraction for quantum computing devices. Removal of the 4.7 % ^{29}Si nuclear spins in natural silicon allows for exceedingly long coherence (T_2) times of qubits, making incorporation of highly enriched ^{28}Si into devices critical for solid state quantum information. Low roughness epitaxial ^{28}Si thin films are achieved by depositing in an island growth mode at temperatures of 300 C to 400 C, and the morphology is verified using scanning tunneling microscopy. Further, the crystalline quality of the films is shown using cross-sectional transmission electron microscopy. Finally, the chemical purity and broader electrical properties of the ^{28}Si films are assessed by secondary ion mass spectroscopy as well as capacitance–voltage profiling, schottky diode measurements, and hall measurements.

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