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Polytypism driven zero-field splitting of silicon vacancies in 6H -SiC

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Abstract

© 2018 American Physical Society. The fine-structure splitting in zero magnetic field allows one to access the coherent control and manipulation of polarized spin states. Here the zero-field splitting (ZFS) of the S=3/2 silicon vacancy-related centers in 6H-SiC is explored by means of electron paramagnetic resonance and electron nuclear double resonance techniques, combined with first-principle calculations. We show that the centers not only possess significantly different absolute values of ZFS, but they also differ in their sign. This diversity is rationalized by a flattened/elongated character of their spin-density distribution, potentially alters spin-photon entanglement, and suggests these centers for qubits in the upcoming technology of quantum communication and quantum-information processing.

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