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Room Temperature Optically-Detected Magnetic Resonance of Silicon Vacancies in SiC SAMUEL G. CARTER, EVAN R. GLASER, BRAD D. WEAVER, Naval Research Laboratory — Single vacancies and vacancy pairs in silicon carbide (SiC) have shown strong potential as quantum bits (qubits) due to demonstrations of spin coherence at room temperature and the maturity of semiconductor device processing in this material system. The majority of work so far on the Si vacancy has still been at low temperatures and high magnetic fields with electron paramagnetic resonance detection, which are not well-suited for many applications. Here, we demonstrate room temperature optically detected magnetic resonance (ODMR) of the Si vacancy in SiC for a series of relatively low magnetic fields. At these fields, there are changes in the ODMR signal due to various effects including the crossing of different spin states. We measure the excitation wavelength dependence and time-dependence of the optical process that orients and detects the spin state, perform microwave pulse control of the spins showing Rabi oscillations, and measure the emission lifetime of the defect to be 6 ns. These results provide a better understanding of the properties of this system and the conditions under which the spin states of the vacancy can be controlled.

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