Abstract Submitted
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Persistence of single spin coherence above room temperature in diamond[1] D.M. TOYLI, D.J. CHRISTLE, B.B. BUCKLEY, D.D. AWSCHALOM, Center for Spintronics and Quantum Computation, University of California, Santa Barbara, CA, A. ALKAUSKAS, C.G. VAN DE WALLE, Materials Department, University of California, Santa Barbara, California, CA — The nitrogen vacancy (NV) center in diamond is unique among single spin systems because of its robust optical spin initialization, optical spin readout, and room temperature spin coherence. However, there is not yet an understanding of what processes limit the NV center's spin properties at higher temperatures. We address this question by performing pulsed electron spin resonance and spin-resolved optical lifetime measurements on single defects at elevated temperatures [1]. The measurements demonstrate that the NV center's spin coherence remains robust at high temperatures while its spin-dependent photoluminescence diminishes above 600 K due to nonradiative relaxation. These results provide an enhanced understanding of the NV center orbital structure and also suggest the possibility of using single spins in diamond for nanoscale thermometry with sensitivities on the order of 100 mK $\mathrm{Hz}^{-1/2}$ over a broad temperature range.

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