Abstract Submitted
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Carbon-antisite vacancy defect in 4H silicon carbide for realizing solid state qubit[1] ADAM GALI, KRISZTIÁN SZÁSZ, VIKTOR IVÁDY, Wigner Research Centre for Physics, Hungarian Academy of Sciences, IGOR ABRIKOSOV, Linköping University, MICHEL BOCKSTEDTE, University of Erlangen-Nürnberg, ERIK JANZÉN, Linköping University — Dopants in solids are promising candidates for implementations of quantum bits for quantum computing. Silicon carbide (SiC) with engineered point defects is considered as very promising material for the next generation devices, with applications ranging from electronics and photonics to quantum computing. Employing density functional theory and many body perturbation theory, we show that the neutral carbon antisite-vacancy pair (CAV) has high spin ground state, and that its spin may be coherently manipulated by optical excitation in n-type 4H SiC. As the positively charged CAV defect in 4H SiC has been recently engineered to act as single photon source [1], our finding brings a hope that optically addressed quantum bits can be realized by the neutral CAV defects in 4H SiC, and provide an additional target for researchers seeking for solid state single color centers for quantum information processes and metrology. The calculated zero-phonon line of the optically excited state is about 1550 nm (0.8 eV) which perfectly fits to the telecom wavelengths, that makes this qubit candidate very promising for integration of quantum optics devices with existing fiber optics technology. [1] S. Castelletto et al., Nature Materials, 13, 151-156 (2014)

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