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Defect qubit-nanophotonic structures based on silicon carbide[1] G. CALUSINE, A. POLITI, D.D. AWSCHALOM, Center for Spintronics and Quantum Computation, University of California, Santa Barbara, California 93106 — Defect qubits in silicon carbide (SiC) have recently emerged as a promising alternative to the nitrogen vacancy center in diamond for applications in solid state quantum information technologies[2]. One common polytype of SiC, commonly referred to as 3C, is commercially available as a high quality single crystal epitaxial film grown on silicon substrates. We demonstrate that various techniques used to create, polarize, manipulate, and measure nitrogen vacancy centers can be similarly applied to defect spin qubits in 3C silicon carbide, even up to room temperature[3]. Additionally, we exploit 3C SiC's availability as a heteroepitaxial layer on silicon to incorporate these defect qubits into nanophotonic devices. We present the results of simulations and measurements on nano-fabricated optical devices incorporating defect qubits. These results demonstrate a promising route towards silicon carbide based hybrid light-matter quantum systems.

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[2]W. F. Koehl, B.B Buckley, F.J Heremans, G. Calusine, and D.D. Awschalom, *Nature* **479**, 84-87 (2011)
[3]A. L. Falk, B.B. Buckley, G. Calusine, W.F. Koehl, V.V. Dobrovitski, A. Politi, and D.D. Awschalom, (submitted)

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