Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Optical and Spin Signatures of Transition Metal Impurities in Silicon Carbide[1] WILLIAM KOEHL, SAMUEL J. WHITELY, BERK DILER, ALEXANDRE BOURASSA, DAVID D. AWSCHALOM , Institute for Molecular Engineering, University of Chicago, NGUYEN TIEN SON , Department of Physics, Chemistry and Biology, Linkping University, Sweden — Point defects and impurities are increasingly viewed as an important resource for solid-state implementations of quantum information technologies. Electronic spins bound to point defects like the nitrogen vacancy center in diamond and divacancy in silicon carbide are especially attractive because they function as long-lived qubit states that can be controlled optically at the single-site level. These capabilities have generated a growing interest in identifying other classes of point defect with similar properties, since discovery of such systems might allow for new ranges of functionality in solid-state quantum device design. Transition metal ions are a promising area for exploration, since they often introduce isolated electronic levels within the bandgaps of semiconductors and possess a wide variety of magnetic and optical properties. Here we describe recent experimental studies of the optical and spin properties of transition metal impurities in silicon carbide. Using ensemble spectroscopies, we evaluate their potential for use as optically-controllable spin states within this industrially-important, wide-bandgap, optoelectronic material.

[1]This work supported by the AFOSR, NSF MRSEC, and Argonne LDRD Program.

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Date submitted: 06 Nov 2015 Electronic form version 1.4