Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Fluorescent Defects in Hexagonal Boron Nitride[1] ANNEMARIE L. EXARHOS, KAMERON OSER, DAVID A. HOPPER, RICHARD R. GROTE, LEE C. BASSETT, University of Pennsylvania — Mono- and few-layer hexagonal boron nitride (h-BN) can host defects whose electronic states lie deep within the bandgap, similar to the nitrogen-vacancy color center in bulk diamond. Here, we study defect creation in h-BN through irradiation and thermal annealing. We employ confocal photoluminescence (PL) imaging and spectroscopy under various excitation energies on both supported and suspended h-BN to identify and characterize the emission of isolated defect centers. Polarization- and temperature-dependent measurements of the observed PL are used to map out the electronic structure of the defects, enabling optical control of fluorescent defects in h-BN. This knowledge, coupled with the spatial confinement to 2D and the unique electrical, optical, and mechanical properties of h-BN, will enable the use of these defects for quantum sensing and other applications in quantum information processing.

[1]Work supported by the ARO (W911NF-15-1-0589) and NSF MRSEC (DMR-1120901).

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Date submitted: 06 Nov 2015 Electronic form version 1.4