Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Optimizing structure in nanodiamonds using in-situ strain-sensitive Bragg coherent diffraction imaging.[1] STEPHAN HRUSZKEWYCZ, WONSUK CHA, ANDREW ULVESTAD, PAUL FUOSS, F. JOSEPH HEREMANS[2], Materials Sciences Division, Argonne National Lab, ROSS HARDER, X-ray Science Division, Argonne National Lab, PAOLO ANDRICH, CHRISTOPHER ANDERSON, DAVID AWSCHALOM[3], Institute for Molecular Engineering, University of Chicago — The nitrogen-vacancy center in diamond has attracted considerable attention for nanoscale sensing due to unique optical and spin properties. Many of these applications require diamond nanoparticles which contain large amounts of residual strain due to the detonation or milling process used in their fabrication. Here, we present experimental, in-situ observations of changes in morphology and internal strain state of commercial nanodiamonds during high-temperature annealing using Bragg coherent diffraction imaging to reconstruct a strain-sensitive 3D image of individual sub-micron-sized crystals [1]. We find minimal structural changes to the nanodiamonds at temperatures less than 650 C, and that at higher temperatures up to 750 C, the diamond-structured volume fraction of nanocrystals tend to shrink. The degree of internal lattice distortions within nanodiamond particles also decreases during the anneal. Our findings potentially enable the design of efficient processing of commercial nanodiamonds into viable materials suitable for device design. [1] I. Robinson et al., Nat. Mater. 8, 291 (2009).

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Date submitted: 11 Nov 2016 Electronic form version 1.4