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Typ: Oral

Local formation of nitrogen-vacancy centers in diamond by swift heavy ions

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We exposed nitrogen-implanted diamonds to beams of swift heavy ions (1 GeV, 4MeV/u) and find that these irradiations lead directly to the formation of nitrogen vacancy (NV) centers, without thermal annealing. We compare the photoluminescence intensities of swift heavy ion activated NV centers to those formed by irradiation with low-energy electrons and by thermal annealing. NV yields from irradiations with swift heavy ions are 0.1 of yields from low energy electrons and 0.02 of yields from thermal annealing. We discuss possible mechanisms of NV center formation by swift heavy ions such as electronic excitations and thermal spikes. While forming NV centers with low efficiency, swift heavy ions could enable the formation of three dimensional NV assemblies over relatively large distances of tens of micrometers. Further, our results show that NV center formation is a local probe of (partial) lattice damage relaxation by electronic excitations in diamond.

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Ref.:

[1] J. Schwartz, et al., J. Appl. Phys. 116, 214107 (2014)

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