

Publication

(111)-oriented, single crystal diamond tips for nanoscale scanning probe imaging of out-of-plane magnetic fields

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We present an implementation of all-diamond scanning probes for scanning nitrogen-vacancy (NV) magnetometry fabricated from (111)-oriented diamond material. The realized scanning probe tips on average contain single NV spins, a quarter of which have their spin quantization axis aligned parallel to the tip direction. Such tips enable single-axis vector magnetic field imaging with a nanoscale resolution, where the measurement axis is oriented normal to the scan plane. We discuss how these tips bring multiple practical advantages for NV magnetometry, in particular, regarding quantitative analysis of the resulting data. We further demonstrate the beneficial optical properties of NVs oriented along the tip direction, such as polarization-insensitive excitation, which simplifies optical setups needed for NV magnetometry. Our results will be impactful for scanning NV magnetometry in general and for applications in spintronics and the investigation of thin film magnets in particular.

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