Nitrogen incorporation during CVD diamond growth for quantum technologies

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The negatively charged nitrogen vacancy center (NV) is a paramagnetic (S=1) defect in diamond with coherence times up to milliseconds[1] even at room temperature. The NV center's spin can be initialized and read out optically as well as manipulated by a microwave, what makes it a promising candidate for quantum technologies like magnetometry[2].

To fabricate NV centers, nitrogen needs to be incorporated into the diamond lattice. Apart from ion implantation there is CVD diamond growth in the presence of nitrogen.

The nitrogen incorporation during the CVD growth is dependent on the growth temperature[3] and the diamond crystallographic orientation[4]. Moreover most single crystal diamond samples exhibit a surface miscut. That can affect also the growth rate[4,5]. Here, we investigate the impact of the miscut on the nitrogen incorporation during the CVD overgrowth and we analyse the constitution of the spin bath around NV centers in nitrogen-doped diamond layers with regard to the miscut angle using the double electron-electron resonance (DEER) sequence[6].

References

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