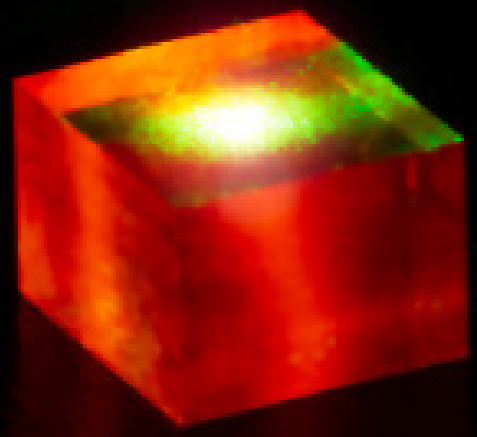
DNV-B1™
Unlocking next generation quantum technologies

June 2020

Perfectly imperfect diamonds, uniquely designed for quantum applications



DNV™ Series

elementsix™
DE BEERS GROUP

DNV-B1™

Single crystal diamond

Adding to its single crystal diamond portfolio grown by chemical vapour deposition (CVD), Element Six brings to market its first general-purpose quantum grade of single crystal, developed through a patented process with deliberate and controlled nitrogen-vacancy (NV) doping. DNV-B1™ is an ideal starting material for those interested in researching NV ensembles for quantum demonstrations, masers, detection of RF radiation, gyroscopes, sensing and further projects.

Advancing diamond quantum technologies

Diamond NV (DNV) centres offer researchers a unique solid-state platform with spin qubits that can be initialised and read out with long qubit lifetimes at room temperature.

These properties stem from diamond's unique structure and strong bonds. DNV-B1™ is a baseline material developed to provide a uniform density of NV defects, specifically designed for emerging diamond applications that require ensembles of NV centres.

DNV-B1™ CVD diamonds

DNV-B1™

DNV-B1™ material shows spin coherence times ~1 µs, which is approaching the theoretical limit for this concentration combination of nitrogen and natural isotopic content (see Figure 1).

When a Hahn-echo measurement is performed, T_2 is typically around 200 µs.

Further reading

1. Markham, M. and Twitchen, D. (2020). The diamond quantum revolution. Physics World 33, 39
2. Zhang, H. et al. (2018). Little bits of diamond: Optically detected magnetic resonance of nitrogen-vacancy centers. American Journal of Physics 86, 225. https://doi.org/10.1119/1.5023389

Specifications and tolerances	Values
Crystallography	Major {100} polished faces
Crystallographic orientation (miscut)	< +/-3°
Typical dimensions	3 mm x 3 mm x 0.5 mm
Edge features	< 0.2 mm
Roughness, Ra	< 30 nm†
Material properties	**Values**
^{13}C	1.1%
Typical [Ns^0] (before treatment)	800 ppb
Typical [NV]	300 ppb
Typical spin coherence time T_2*	1 µs
Typical spin coherence time T_2	200 µs

† Ra < 1 nm achievable

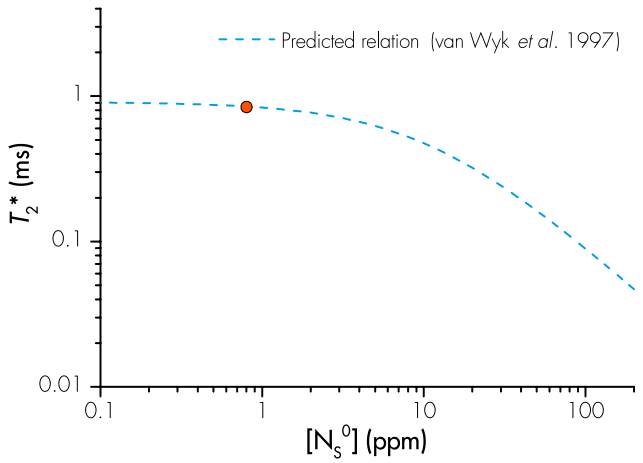


Figure 1: Spin coherence vs. nitrogen concentration (van Wyk et al. (1997). J. Phys. D: Appl. Phys. 30, 1790)

Contact us

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