Optics

SINGLE CRYSTAL DIAMOND

QUANTUM GRADE

Quantum-grade single crystal diamond (SCD-Q) is engineered specifically for quantum technologies, with precision-controlled nitrogen vacancy (NV) center concentration optimized for maximum performance. Combining long room-temperature spin lifetimes, high sensitivity, and exceptional optical properties, this material provides an ideal platform for quantum computing, sensing, and networking applications.

FEATURES

- Precision-controlled nitrogen vacancy (NV) center concentration
- Optimized spin coherence time
- Long room-temperature spin lifetimes
- High quantum sensing sensitivity
- Exceptional optical properties

APPLICATIONS

- Quantum sensing and metrology
- Quantum computing
- Quantum networking
- Spin-based quantum experiments
- Magnetometry and field sensing

COHERENT

Grown via chemical vapor deposition (CVD) process, SCD-Q features precisely controlled nitrogen vacancy (NV) center concentration, enabling reproducible performance for quantum applications. The NV center in diamond has emerged as the gold standard solid-state platform for quantum spin-based experiments, offering unique advantages over competing quantum systems.

The combination of long room-temperature spin lifetimes and high sensitivity makes the NV center an exceptional candidate for quantum experimentation and engineering across diverse applications. Unlike many quantum platforms that require cryogenic cooling, diamond NV centers maintain quantum coherence at room temperature, significantly simplifying experimental setups and enabling practical deployment in real-world environments.

SCD-Q is optimized with an NV center concentration of approximately 300 ppb—a carefully chosen specification that maximizes available signal strength while maintaining T_2* spin coherence times close to the theoretical maximum for diamond with natural isotopic abundance. This balance provides an excellent foundation for both quantum sensing applications, which benefit from higher signal levels, and coherent control experiments, which require extended coherence times.

Due to its exceptional optical properties, there is straightforward optical access to NV centers via green light excitation and red fluorescence detection enables simple integration with standard optical components and microscopy systems. This optical addressability, combined with the material's room-temperature operation and long coherence times, positions SCD-Q as an ideal platform for researchers and engineers developing next-generation quantum technologies.

Single Crystal Diamond - Quantum Grade (SCD-Q)	
Growth Method	Plasma Enhanced Chemical Vapor Deposition
Physical Characteristics	
Structure	Single Crystal
Crystalline Orientation	{1 0 0} major faces
Thickness	0.25-0.75 mm
Surface Roughness – Sa	<0.5 nm
Material Properties	
Carbon 13 concentration	Natural, ~1.1%
Nitrogen Concentration [N_s^0]	800 ppb
NV Center Concentration	300 ppb
Boron Concentration	<1 ppb
Room Temperature T_2	200 µs
Room Temperature T_2*	1 µs

Coherent offers multiple grades of CVD diamond tailored to specific optical, thermal, electronic, quantum, and custom requirements. Contact us to discuss material selection for your application

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