



Technical Data Sheet

ACS Material Quantum Diamonds

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Contact Information:

ACS Material, LLC

Address: 959 E Walnut St., Suite 100

Pasadena, CA 91106, USA

Phone: (866) 227-0656

Fax: (781) 518-0284

E-Mail: contact@acsmaterial.com

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I. Product Overview

The nitrogen-vacancy (NV) center is a unique atomic-scale defect in diamond, formed when a nitrogen atom substitutes for a carbon atom adjacent to a lattice vacancy. This defect endows the diamond with remarkable optical and electronic properties, making it a foundational element in emerging quantum technologies. NV centers exhibit stable fluorescence and exceptionally long electron spin coherence times, enabling advanced applications in magnetic field sensing, bioimaging, and quantum information processing.

Due to these properties, NV-diamond platforms have attracted significant interest from both academia and industry—garnering attention from leading organizations such as Lockheed Martin and Bosch. Research into NV centers remains a rapidly advancing field within condensed matter physics and quantum science, driving innovation across a range of scientific and technological frontiers.

II. Product Specifications

ACS Material currently offers five types of Quantum Diamonds.

- Single NV Diamond Q-DNV-Ran(S)

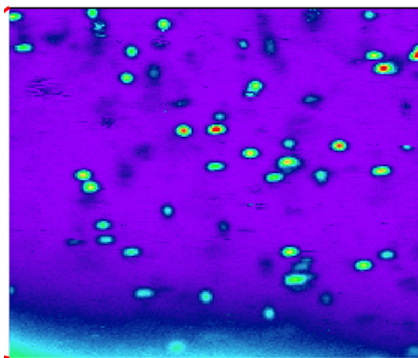
Features :

Perfect coherence : $T_2 \approx 200 \mu s$

Controllable concentration ($1 - 10/\mu m^2$)

Quantum Properties:

Parameters	Values
[NV-]	$1/\mu m^2$
T1	$\sim 5ms$
T2	$\sim 200\mu s$
T3	$\sim 0.5 - 8\mu s$



- Single NV Diamond Q-DNV-Array(S)

Features :

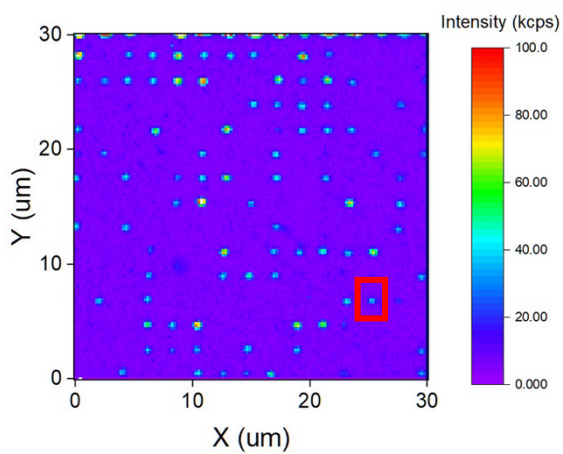
Depth controllable (5-100nm)

Patterned for easy positioning of NV centers

Long coherence time, deep NV centers $T_2 > 200 \mu s$

Quantum Properties:

Parameters	Values (d>50nm)
[NV-]	$0.25/\mu m^2$
T1	$\sim 5ms$
T2	$100 - 200 \mu s$
T3	$\sim 0.3 - 2.2 \mu s$



- NV Ensemble Diamond Q-DNV-2D(E)

Features :

Depth controllable (5-100nm)

Controllable concentration

Oxygen-terminated surface

Quantum Properties:

Parameters	Values (d>50nm)
[NV-]	$10^{11} - 10^{13} / \text{cm}^2$
T1	1 – 5ms
T2	10 – 100 μs
T3	$\sim 0.3 - 0.8 \mu\text{s}$

- NV Ensemble Diamond Q-DNV-Bulk(E)

Features :

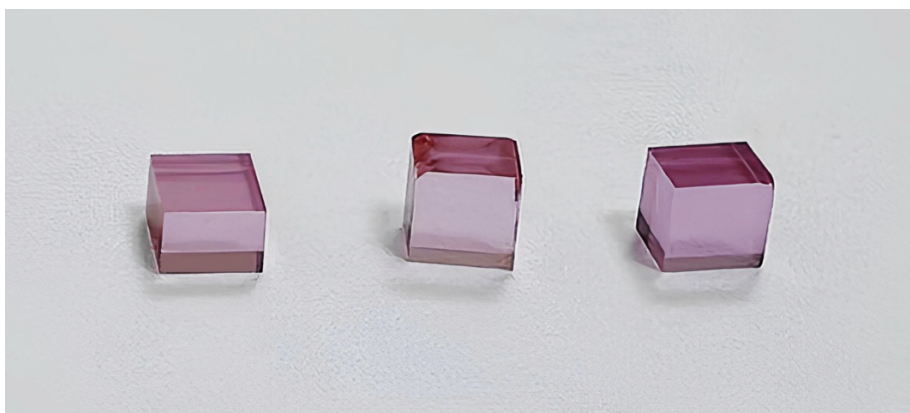
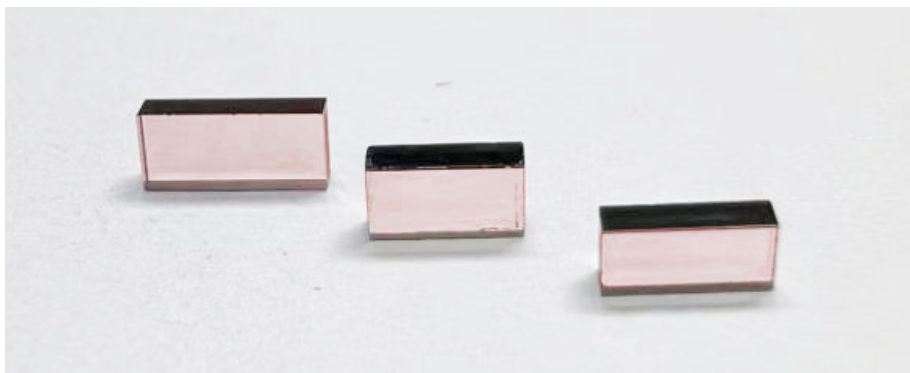
Depth controllable (5-100nm).

Controllable concentration.

Oxygen-terminated surface

Quantum Properties:

Parameters	Values
[NV-]	10 – 300ppb
T1	$\sim 5\text{ms}$
T2	50 – 200 μs
T3	$\sim 0.7 - 1 \mu\text{s}$

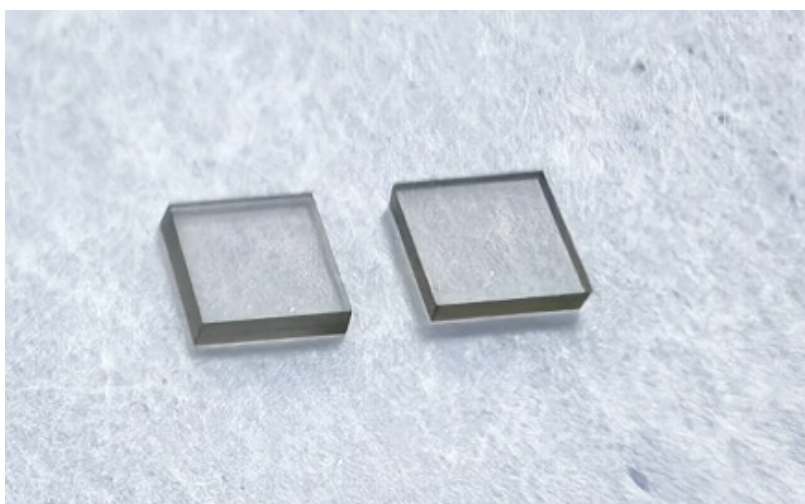
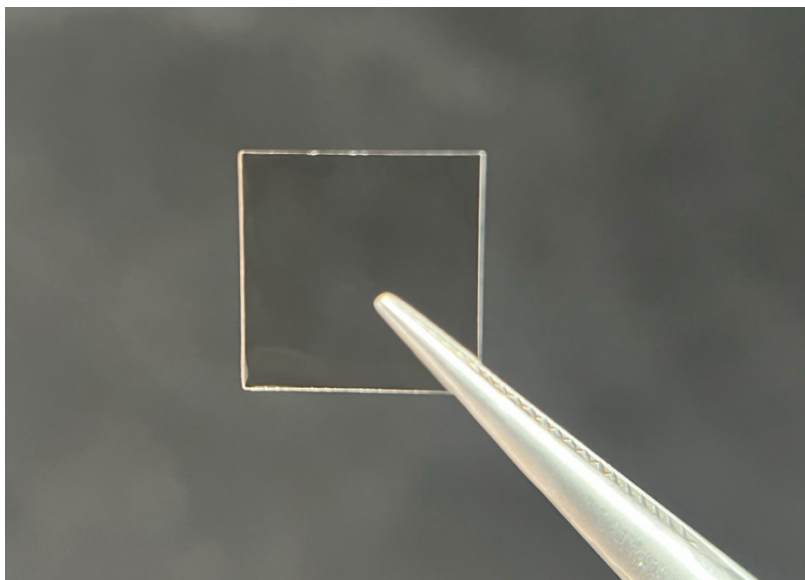


- Electronic-Grade Diamond (Q-DNV-ELD)

Electronic-grade diamond features nitrogen impurity levels below 5 ppb and ultra-low background fluorescence, making it highly suitable for advanced quantum research.

Properties :

Parameters	Values
Faces	{100}
Roughness	Ra<3 nm
¹³ C	1.1%
[N]	<5 ppb
[B]	<1 ppb
[NV-]	<0.05 ppb



III. Application

- Quantum communication
- Magnetic field sensing
- Electric field sensing
- Temperature sensing
- Maser
- Quantum gyroscope

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