ENABLE THE IMPOSSIBLE

Our single crystal CVD diamond opens the way to new horizons in product development throughout the photonics industry.
Element Six single crystal CVD diamond components can transform many new and existing applications, in a manner not possible with traditional materials.

Diamond ATR prisms have opened up new application areas for FTIR spectroscopy by exploiting its unsurpassed optical transparency, chemical inertness and mechanical robustness.

What’s more, single crystal CVD diamond can be engineered to exhibit extremely low birefringence, as well as low scatter at shorter wavelengths, to minimize beam loss and distortion.

ENGINEERED TO EXPAND THE BOUNDARIES IN PHOTONICS

In demanding applications where the lifetime of the optic is a critical parameter in the performance of the equipment and processes, single crystal CVD diamond sets the standard.

It enables optical engineers to design new and innovative products for their industries. Crucially, single crystal CVD diamond opens up new applications which have not been possible with less extreme materials. This revolutionary material also offers the prospect of unparalleled performance and reduced cost of ownership in existing optical applications.

Optical components made of single crystal CVD diamond have been proven in the field for many years, delivering unsurpassed performance and reliability.

THE THREE TYPES OF SINGLE CRYSTAL CVD DIAMOND

SINGLE CRYSTAL OPTICAL GRADE

A unique optical material with:
– A wide spectral range
– Low absorption at key laser frequencies
– High thermal conductivity for heat dissipation
– Low thermal expansion

Single crystal optical grade diamond’s superior ability to conduct heat eliminates thermal lensing, which can otherwise result in beam distortion or window failure. Application areas include high power laser exit windows, beam splitters, output couplers and optical components for spectroscopy and endoscopy.

SINGLE CRYSTAL OPTICAL PLUS LOW BIREFRINGENCE

The ideal material for high end lasers:
– Low birefringence of $\Delta n < 2 \times 10^{-5}$
– No significant change to the polarization of light

Low birefringence single crystal CVD diamond is ideal in intracavity applications and where polarized light is needed. A typical example where the optical transmission and thermal conductivity are combined is in the cavity of solid state lasers, semiconductor lasers or VECSELs.

SINGLE CRYSTAL OPTICAL PLUS LOW ABSORPTION

A material for the most demanding applications:
– Offers the highest performance in the most extreme conditions
– Highest Raman gain coefficient of any comparable material
– Combines high thermal conductivity with the lowest losses available

Low absorption single crystal CVD diamond is used as the gain medium for Raman lasers and as a low loss intracavity heat spreader for disc lasers. The high Raman gain coefficient enables the development of, for example, new high power ‘eye safe’ lasers for defense and aerospace industries.

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Single Crystal CVD Diamond
EXTREME PERFORMANCE PROPERTIES

GOING BEYOND TODAY'S TECHNICAL BOUNDARIES

With the use of single crystal CVD diamond, new opportunities arise for the development of optical components for use in extreme situations where high light intensity combines with high thermal loads in aggressive and hazardous environments. Due to its biocompatibility single crystal CVD diamond is also ideal for use in the medical photonics industry.

TAILOR-MADE SOLUTIONS

Element Six single crystal CVD diamond components can be engineered to feature the right combination of absorption and birefringence for your application. These CVD diamond components can then be processed into virtually any shape and even mounted to enable you to get the best performance out of your system.

Our specialized team of application engineers and processing technologists can design the right component for your application. This includes the windows, prisms and lenses, their processing and mounting, as well as partial or anti-reflective coatings. Mounts can be of simple flange design or made to customer specifications which facilitate special features such as water or air cooling if required.

MODELING AND ANALYZING PROPOSED SOLUTIONS

Our engineers and technologists use the latest computer modelling systems to model and analyze every aspect of the thermal and mechanical properties of a proposed application. In this way the ultimate performance of a component can be accurately predicted before prototyping.

ADVANTAGES OF SINGLE CRYSTAL CVD DIAMOND

- Extremely broad transmission spectrum from 220 nm up to >50 µm
- High thermal conductivity (>2000 W/mK)
- Sizes available up to 8 x 8 x 2 mm
- Path length >10 mm possible
- Biocompatible
- Scratch resistant
- Chemically inert and operates in corrosive environments
- Low scatter
- High Raman gain

Single Crystal CVD Diamond
Element Six Technologies is a division of Element Six, the world’s market leader in the manufacture and development of synthetic diamond, established in the 1940s.

Today Element Six is a $500 million company operating production facilities in 7 countries and serving over 5,000 customers worldwide.

Element Six Technologies operates two production and technical facilities around the globe; Santa Clara in California, and Ascot in the United Kingdom. The new Santa Clara facility offers US based customers a state-of-the-art facility for producing CVD diamond solutions for use in a wide array of advanced industry applications including optics, power transmission, sanitization and water treatment, semiconductors and sensors.

In 2013, Element Six opened the world’s largest and most sophisticated synthetic diamond supermaterials research and development facility in Oxford, UK.

If you would like to know about Element Six please visit our website at www.e6.com/optical, or contact us at any of the addresses below.

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