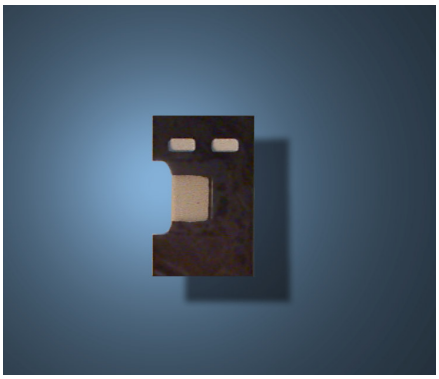
Thin Diamond Membrane



The unique properties of thin diamond membranes offer an affordable alternative to existing materials used in high energy, x-ray and thermal isolation applications. Applied Diamond creates foils, films, windows and detectors which out-last and out-perform alternative materials. Our years of experience and manufacturing innovations have led to cost effective solutions for our clients' next generation applications.

Applied Diamond produces thin diamond products, 300nm to 5µm thick. We offer both nano and microcrystalline diamond films, tailored to your application requirements.

Superior Properties for Next Generation Applications

An excellent material for use in high energy research applications; diamond's tensile strength, beam resistance, low noise, fast response and transmission across a variety of wave lengths make diamond a superior material for a variety of challenging applications including stripper foils, beam diagnostics and positioning, particle detectors, and synchrotron windows.

Diamond Windows

The unique properties of diamond make it an ideal material for use in optical, infrared, microwave, x-ray, and terahertz applications. Diamond has only a very slight variation in index of refraction over the entire spectral range compared to other materials. Applied Diamond's very thin windows allow for higher magnifications to be used and produce high quality visible images due to markedly reduced chromatic or spherical aberrations. Its structural strength and high thermal conductivity withstand higher power levels and pressure differences. Use Applied Diamond thin material for flow cells, cryostats, and sample holders. Applied Diamond produces both free-standing diamond with a support lattice or diamond mounted to a flange.

Diamond Foils in High Energy Physics

With the next generation of accelerators operating with heavy isotopes and facilities producing even higher power, more robust effective stripper foils are needed. Carbon foils fail from radiation exposure and degrade faster, requiring frequent replacement and resulting in reduced available beam time. Due to its thermal conductivity and structural strength, a diamond foil can withstand high power and energy, including a 1 GeV beam used in accelerator research. Diamond stripper foils withstand higher power testing and last longer resulting in less frequent replacement and a reduction in radiation exposure for maintenance technicians.

X-ray Detector/Beam Position Monitor

Thin diamond is transparent to x-rays and greatly reduces parallax viewing errors. These properties make diamond an ideal material for X-ray detector or beam positioning monitors. The X-ray beam passes through the thin diamond and makes it fluoresce a bright blue. In X-ray transmission mode, this shows immediately and continuously the position and intensity of the x-ray beam.

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Microanalytical Tool for Particle Detection

Microbeam sychrotron x-ray fluorescence (S-XRF) can quantify a wide range of trace elements present in samples of minute volume. CVD diamond substrates capable of meeting the need for a thin (~1 µm thick), highly pure, low atomic number substrate are ideal for this work. Diamond substrates have already proven to be more robust than SiN windows and show potential for significant reductions in x-ray backgrounds, which enhance the range and precision of fingerprinting the trace compositions of individual particles.

Electrical Isolation—Transition From SOI to SOD

Silicon on diamond (SOD) is achieved by joining a thin single crystalline Si device layer to a thin CVD diamond layer. Diamond replaces the silicon dioxide in the silicon on insulator structure and serves as an electrical insulator, heat spreader and support substrate. Like silicon dioxide, diamond is a good electrical insulator with the added advantage of diamond's far superior thermal conductivity. As a result, SOD can sustain more than 10 times higher power than SOI, permitting more than 3-fold greater integration density of circuits. Devices such as MOSFETS, Bipolar transistors, JFETS and diodes can be fabricated in the re-crystallized silicon that sits on top of the diamond film.

Product Fabrication

Applied Diamond can grow thin membranes to your thickness and quality specifications. Our engineered laser systems with computer controlled motion allows for cutting of complex geometries in prototype quantities or economical, long production runs. These thin membranes can be transferred from our typical silicon substrates to other support materials providing more design options.

Exceptional Properties, Expert Support

Applied Diamond, Inc. provides more than just material to your challenging applications. We pride ourselves on the creative collaboration and innovative solutions we offer our clients. Our extensive knowledge of diamond and years of practical application have allowed us to tailor fit our materials to your particular needs. We assist our clients in solving the challenges of cutting-edge research where no other material will suffice.

For More Information Call — 302-999-1132

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