CVD DIAMOND SUBSTRATES

MultiSpectral Laser Optics • Dielectric Windows • Heat Sinks
CVD DIAMOND SUBSTRATES

II-VI Infrared is pleased to introduce its new line of chemical vapor deposition (CVD) diamond substrates for the infrared optics (IR) market. For more than 20 years, II-VI has been producing CVD zinc selenide (ZnSe) and zinc sulfide (ZnS) for IR optical applications. Our expertise in CVD crystal growth accelerated the development program for synthesizing high quality CVD diamond material tailored specifically for optical applications.

Applications include:
- CO₂ Laser Windows (10.6 Microns)
  - High Power Industrial Lasers
- High Power Microwave Windows
  - Gyrotrons, Fusion Reactors
  - Radar, Directed Energy Weapons
- Thermal Management
  - Heat Sinks

Material Properties

<table>
<thead>
<tr>
<th>Physical Properties</th>
<th>Optical Properties</th>
<th>Thermal Properties</th>
<th>Mechanical Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structure</td>
<td>Refractive Index @ 10.6 µm</td>
<td>Thermal Conductivity @ 20°C</td>
<td>Young's Modulus</td>
</tr>
<tr>
<td>Density</td>
<td>0.12/cm</td>
<td>20 W/cm·K</td>
<td>1220 GPa</td>
</tr>
<tr>
<td>Electrical Density</td>
<td>2.38</td>
<td>Specific Heat</td>
<td>200-1000 MPa</td>
</tr>
<tr>
<td>Dielectric Constant</td>
<td>9.6 x 10⁻⁶/°C</td>
<td>Linear Expansion Coefficient @ 20°C</td>
<td>1220 GPa</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Unique Properties

<table>
<thead>
<tr>
<th>Extreme Hardness</th>
<th>Scratch Resistant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highest Thermal Conductivity</td>
<td>Five Times Better Than Copper</td>
</tr>
<tr>
<td>Low Thermal Expansion Coefficient</td>
<td>Resistant to Thermal Shock</td>
</tr>
<tr>
<td>Transparent Over Wide Range</td>
<td>Deep UV Far Infrared Microwave</td>
</tr>
<tr>
<td>Chemically Inert</td>
<td>Durable Biocompatible</td>
</tr>
</tbody>
</table>

Applications include:
- CO₂ Laser Windows (10.6 Microns)
  - High Power Industrial Lasers
- High Power Microwave Windows
  - Gyrotrons, Fusion Reactors
  - Radar, Directed Energy Weapons
- Thermal Management
  - Heat Sinks
**Transmission of Optical CVD Diamond**
(uncoated, thickness 981 µm)

![Graph showing transmission vs. wavelength](image)

**Thermal Conductivity**

<table>
<thead>
<tr>
<th>T (°C)</th>
<th>k (W/m·K)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>2190</td>
</tr>
<tr>
<td>100</td>
<td>1560</td>
</tr>
<tr>
<td>200</td>
<td>1170</td>
</tr>
<tr>
<td>300</td>
<td>940</td>
</tr>
<tr>
<td>400</td>
<td>790</td>
</tr>
<tr>
<td>500</td>
<td>700</td>
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</table>

![Graph showing thermal conductivity vs. temperature](image)

**Index of Refraction**

<table>
<thead>
<tr>
<th>Wavelength (µm)</th>
<th>Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.22</td>
<td>2.722</td>
</tr>
<tr>
<td>0.35</td>
<td>2.488</td>
</tr>
<tr>
<td>0.56</td>
<td>2.421</td>
</tr>
<tr>
<td>0.89</td>
<td>2.396</td>
</tr>
<tr>
<td>1.41</td>
<td>2.387</td>
</tr>
<tr>
<td>2.25</td>
<td>2.383</td>
</tr>
<tr>
<td>3.56</td>
<td>2.381</td>
</tr>
<tr>
<td>5.65</td>
<td>2.381</td>
</tr>
<tr>
<td>8.95</td>
<td>2.381</td>
</tr>
<tr>
<td>14.1</td>
<td>2.380</td>
</tr>
<tr>
<td>22.5</td>
<td>2.380</td>
</tr>
<tr>
<td>25.2</td>
<td>2.380</td>
</tr>
</tbody>
</table>

![Graph showing index of refraction vs. wavelength](image)
To place an order, contact a II-VI sales representative at any of the following locations, or log onto www.iiviinfrared.com/contact for our most complete and up-to-date contact information.

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