CoorsTek is the leader in ceramic substrates for thin-film and thick-film electronics, providing over a dozen substrate types optimized for a variety of processes and applications. Applying our deep expertise in advanced technical ceramics, CoorsTek engineers ceramic materials and substrate processing specifically to the rigorous demands of today’s thin-film and thick-film technology.

**Thin-Film Ceramic Substrates**

CoorsTek thin-film alumina substrates are optimal for most of today’s high reliability thin-film electronics applications. By precisely controlling surface finish, grain size, and surface imperfections, CoorsTek substrates enhance fine-line resolution, spacing, and yield in your thin-film process.

SuperStrate® ceramic substrates are the industry standard for high performance, thin-film substrates — providing an exceptionally smooth surface finish for ultra-fine line geometries and outstanding adhesion bond strengths.

**MidFilm** Ceramic Substrates

Exclusive CoorsTek MidFilm ceramic substrates provide excellent high-frequency performance using etchable ink and photo-formed electronic processes — delivering strong economic value compared to thin-film deposition processes.

MidFilm substrates work exceptionally well with single and multi-layer circuit designs, filling the gap between thin-film deposition and thick-film processes for applications from high-frequency microwave to photonics and multi-chip modules.

**Thick-Film Ceramic Substrates**

CoorsTek developed the standards for thick-film alumina substrates, engineered to provide durable and economical performance for hybrid integrated circuits (HIC), sensors, surface mount devices (SMD), and other thick-film electronics. These substrates minimize resistor variation while enhanced aged adhesion.

DuraStrate® ceramic substrates deliver a 20% increase in strength compared to standard thick-film substrates, particularly useful in applications requiring 0.5 mm (0.020”) or thinner form factor.

**Aluminum Nitride Substrates**

When thermal management is a challenge, CoorsTek aluminum nitride (AlN) substrates help your electronics run cooler — improving performance and extending useful life. Aluminum nitride is an ideal material for LED (light emitting diode) and power electronics applications, uniquely combining:

- excellent thermal conductivity (170 W/m-K)
- high dielectric strength
- thermal expansion coefficient similar to the most common semiconductors like silicon (Si), gallium nitride (GaN), and gallium arsenide (GaAs)

**Overview of SUBSTRATE PROPERTIES BY FAMILY**

<table>
<thead>
<tr>
<th>PROPERTY</th>
<th>UNITS</th>
<th>THIN-FILM</th>
<th>MID-FILM</th>
<th>THICK-FILM</th>
<th>SPECIALTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td></td>
<td>Optimal thin-film performance</td>
<td>Industry standard for thin-film technology for most thin-film applications</td>
<td>Economical high-frequency performance</td>
<td>20% greater strength for thin substrates</td>
</tr>
<tr>
<td>Applications</td>
<td></td>
<td>Ultra-fine line resolution and spacing</td>
<td>Workforce for most thin-film applications</td>
<td></td>
<td>20% greater strength for thin substrates</td>
</tr>
<tr>
<td>Surface finish</td>
<td>mm (μin)</td>
<td>as-fired</td>
<td>&gt;254 (10)</td>
<td>&gt;254 (10)</td>
<td>&gt;254 (10)</td>
</tr>
<tr>
<td>Thickness range</td>
<td>mm (in)</td>
<td>0.020&quot; - 0.154 mm (0.00079&quot; - 0.0060&quot;)</td>
<td>Standard &amp; custom thicknesses available</td>
<td>0.254 - 3.556 mm (0.010&quot; - 0.140&quot;)</td>
<td>Custom thicknesses available</td>
</tr>
<tr>
<td>Size range</td>
<td>mm (in)</td>
<td>Standard rounds: 206.7, 254, 305, 381 (8&quot;, 12&quot;, 12&quot;, 15&quot;) Standard rounds: 101.6, 127 (4&quot;, 5&quot;)</td>
<td>Standard rounds: 100, 150 mm (3.937&quot;, 5.905&quot;)</td>
<td>89.9 mm square (3.5&quot;&quot;)</td>
<td>Wafers Ø 50 - 200 mm (2&quot; - 8&quot;&quot;)</td>
</tr>
<tr>
<td>Flexural strength</td>
<td>MPa (ksi)</td>
<td>682 (99)</td>
<td>620 (90)</td>
<td>582 (86)</td>
<td>572 (83)</td>
</tr>
<tr>
<td>Elastic Modulus</td>
<td>GPa (psi x 10⁶)</td>
<td>372 (54)</td>
<td>372 (54)</td>
<td>372 (54)</td>
<td>372 (54)</td>
</tr>
<tr>
<td>Coefficient of linear thermal expansion</td>
<td>10⁻⁶ / °C</td>
<td>6.3</td>
<td>7.0</td>
<td>7.0</td>
<td>7.0</td>
</tr>
<tr>
<td>Thermal conductivity</td>
<td>W/m-K</td>
<td>27</td>
<td>26.9</td>
<td>26.6</td>
<td>25.5</td>
</tr>
<tr>
<td>Dielectric strength</td>
<td>kV/mm (volts/mil)</td>
<td>640 (25)</td>
<td>600 (23)</td>
<td>450 (17)</td>
<td>22 (575)</td>
</tr>
<tr>
<td>Volume resistivity</td>
<td>Ω-cm</td>
<td>&gt; 10¹³</td>
<td>&gt; 10¹³</td>
<td>&gt; 10¹³</td>
<td>&gt; 10¹³</td>
</tr>
</tbody>
</table>

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Specialty and Custom Substrates

Specialty Ceramic Substrates
Opaque Ceramic Substrates
For light-sensitive semiconductor devices, use CoorsTek opaque ADOS-90R — formulated specifically to block light transmittance and absorb stray light.

Medical Grade Ceramic Substrates
For medical applications, CoorsTek materials are USP Class VI certified.

Custom Substrates & Multi-Layer Structures
As a vertically-integrated leader in engineered ceramics and ceramic tape casting, CoorsTek has developed and produced substrates from more than two dozen materials.

CoorsTek also assembles complex multi-layer ceramic substrates that combine precision channels and features in laminated, hermetically sealed structures — providing high-purity, corrosion resistant “circuit” paths for fluids, gases, or air vacuum.

Customize Your Substrates
CoorsTek ceramic substrates are available in a wide variety of standard and custom thickness, shape, and size. A host of secondary processing options ensure substrates are configured just the way you need them.

Substrate Design Guides
CoorsTek has developed specific, detailed design guidelines for configuring thin-film, thick-film, and aluminum nitride (AlN substrates). Visit coorstek.com for a free download or contact a CoorsTek representative for more information.

About CoorsTek
With over 30 facilities across four continents, CoorsTek is the international partner of choice for companies requiring the unique, high-performance properties of engineered technical ceramics. Learn more at coorstek.com

Consult with CoorsTek Engineers
CoorsTek engineers are available to help you select the optimal material and configure substrate options for your next electronics project. Schedule a consultation now.

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