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 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)

**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</td>
<td>Workhorse for most thin-film applications</td>
<td>Economical thin-film alternative</td>
</tr>
<tr>
<td>Applications</td>
<td></td>
<td>Ultra-fine resolution &amp; spacing</td>
<td></td>
<td></td>
<td>Economical high-frequency performance</td>
</tr>
<tr>
<td>Surface finish</td>
<td>mm (µin)</td>
<td>&lt;254 (10)</td>
<td>&lt;254 (10)</td>
<td>51 (2)</td>
<td>51 (2)</td>
</tr>
<tr>
<td>Thickness range</td>
<td>mm (in)</td>
<td>0.237 - 1.016 mm (0.0095 - 0.040&quot;)</td>
<td>0.237 - 1.016 mm (0.0095 - 0.040&quot;)</td>
<td></td>
<td>0.254 - 3.556 mm (0.010&quot; - 0.140&quot;)</td>
</tr>
<tr>
<td>Size range</td>
<td>mm (in)</td>
<td>Standard: 25.4, 50.8, 76.2, 101.6, 152.4 x 127.0 mm (1&quot;, 2&quot;, 2.5&quot;, 3&quot;, 4&quot;, 5&quot;, 6&quot;)</td>
<td>Standard: 25.4, 50.8, 76.2, 101.6, 152.4 x 127.0 mm (1&quot;, 2&quot;, 2.5&quot;, 3&quot;, 4&quot;, 5&quot;, 6&quot;)</td>
<td></td>
<td>89.9 mm square (3.5&quot;&quot;) to 139.7 x 190.5 mm (5.5&quot; x 7.5&quot;)</td>
</tr>
<tr>
<td>Flexural strength</td>
<td>MPa (ksi)</td>
<td>682 (99)</td>
<td>620 (90)</td>
<td>572 (83)</td>
<td>440 (64)</td>
</tr>
<tr>
<td>Elastic Modulus</td>
<td>GPa (ksi x 10^12)</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>25-250 °C</td>
<td>6.3</td>
<td>6.3</td>
<td>6.3</td>
<td>6.3</td>
</tr>
<tr>
<td>Thermal conductivity</td>
<td>W/m-K</td>
<td>27.0</td>
<td>27.0</td>
<td>27.0</td>
<td>27.0</td>
</tr>
<tr>
<td>Dielectric strength</td>
<td>kV/mm (volts/mil)</td>
<td>640 (25)</td>
<td>600 (24)</td>
<td>550 (22)</td>
<td>470 (19)</td>
</tr>
<tr>
<td>Volume resistivity</td>
<td>Ω-cm</td>
<td>&gt;10^14</td>
<td>&gt;10^14</td>
<td>&gt;10^14</td>
<td>&gt;10^14</td>
</tr>
</tbody>
</table>

**THERMAL CONDUCTIVITY OF CERAMIC SUBSTRATES**

- 90% Alumina
- 95% Alumina
- AlN

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**Specialty Ceramic Substrates**

**LumenStrate™ Ceramic Substrates**
LumenStrate thick-film substrates reflect 10-15% more visible light than standard substrates, critical for high-brightness LEDs.

**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.

Beyond providing the best selection of thin-film and thick-film ceramic substrate materials available, CoorsTek partners with you to customize substrates specifically for your application with a range of options:

- Thickness, size & shape
- “As-fired” and finished
- Surface lapping & polishing
- Laser machining & scribing
- Edge finishing
- Annealing
- Metallization & coating
- Precision tolerances
- Cleaning & inspection
- Subassembly & packaging
- Special quality certification (TS-16949, USP Class VI)

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