LCP Film

Special Solution Casting Technology

Thermotropic Liquid Crystalline Polyester Film
Features 1

★ Utilizing our own developed special thermoplastic resin.

★ Molecules will be aligned (liquid crystal state) when melted (Alpha Moss condition).

★ With our casting method (molding using a solvent), instead of melt molding (Melt molding), in order to eliminate imbalance due to unbalanced center of gravity, suppleness and high strength characteristics can be realized.

★ It is an aromatic polyester resin obtained by ester linkage in a linear chain with basic structure such as parahydroxybenzoic acid.
Features 2

★ Excellent heat resistance ( >270°C ) Appropriate for solder flow
   High melting point
   High glass transition temperature stance

★ Excellent Flame retardancy

★ Excellent Stiffness like metal & Softness like rubber
   High Tensile Strength(crystallinity) and Tensile modulus
   High rigidity

★ Low viscosity, High fluidity

★ Low Moisture absorption
Features 3

★ Excellent High insulation properties at high frequencies
★ Excellent Low dielectric properties at high frequencies
★ Excellent Chemical resistance
★ Excellent Gas barrier property
★ Excellent Energy characteristics at high frequencies.
★ Non-oriented LCP Film
### Property

<table>
<thead>
<tr>
<th>Property</th>
<th>Unit</th>
<th>Conditions</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Electrical Characteristics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relative permittivity</td>
<td>-</td>
<td>1GHz</td>
<td>3.09</td>
</tr>
<tr>
<td>Volume resistivity</td>
<td>Ω・cm</td>
<td>23℃</td>
<td>$39 \times 10^{17}$</td>
</tr>
<tr>
<td><strong>Water absorption Characteristics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water absorption</td>
<td>ppm/℃</td>
<td>85℃/85%RH@168hr</td>
<td>&lt; 0.1</td>
</tr>
<tr>
<td><strong>Mechanical Characteristics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tensile Strength</td>
<td>Mpa</td>
<td>25℃</td>
<td>60$^{*1}$</td>
</tr>
<tr>
<td>Modulus of elasticity</td>
<td>Mpa</td>
<td>25℃</td>
<td>3000$^{*1}$</td>
</tr>
<tr>
<td>Growth rate</td>
<td>%</td>
<td>25℃</td>
<td>7$^{*1}$</td>
</tr>
<tr>
<td><strong>Heat Characteristics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solar heat resistance</td>
<td>-</td>
<td>270℃/30 sec</td>
<td>PASS</td>
</tr>
<tr>
<td>Melting Point</td>
<td></td>
<td>300℃/3 sec</td>
<td>PASS</td>
</tr>
<tr>
<td>Melting Point</td>
<td>℃</td>
<td>DSC method</td>
<td>316</td>
</tr>
<tr>
<td>Thermal Conductivity</td>
<td>W/m・K</td>
<td>-</td>
<td>0.38</td>
</tr>
</tbody>
</table>

$^{*1}$ Aneling : 300℃/60min
In addition to excellent electrical properties in low dielectric constant and low dielectric loss tangent, LCP resin excellent in low water absorption, heat resistance and mold ability is indispensable for high speed communication. Since the coefficient of linear expansion in flow direction is as good as that of metal and is superior in compatibility with copper foil, it is suitable for use in flexible printed circuit board (FPC). Especially, it is expected to be used for FPC for next generation high speed communication 5G and millimeter wave radar of car.
LCP Supply Chain

LCP raw material → LCP film manufacturer → FCCL manufacturer → FPC manufacturer → End user

End user
Automobile
Mobile phone
Robot
etc.

FPC

1 layer FCCL
- Cu
- Polyimide or LCP
- Cu

2 layer FCCL
- Cu
- Polyimide or LCP
- Cu

Copper foil manufacturer

KGK

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Available Sizes

Structure:

LCP Film 13µm~35µm

Sizes:

<table>
<thead>
<tr>
<th>Products</th>
<th>Thickness(µm)</th>
<th>Color</th>
<th>Standard Roll Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAR 13</td>
<td>13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SAR 20</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SAR 25</td>
<td>25</td>
<td>Brown</td>
<td>300mm x 20M</td>
</tr>
<tr>
<td>SAR 30</td>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SAR 35</td>
<td>35</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Please inquire for more different thickness and width

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FCCL(LCP//Copper Multi layer film)

Features:
- Excellent heat resistance
- Low moisture absorption (low dielectric)
- 250 thermoforming of at °C
- Gas barrier properties
- Very high tensile strength (to 200 MPa) and tensile modulus (to 30,000 MPa)
- Non-oriented film

Applications:
- FPC circuit board
- LED board

Sizes:

<table>
<thead>
<tr>
<th>Products</th>
<th>Thickness</th>
<th>Structure</th>
<th>Standard Roll Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAR25C12</td>
<td>0.037</td>
<td>LCP(25 μm)//Copper(12 μm)</td>
<td>300mm × 20M</td>
</tr>
</tbody>
</table>

*Please inquire for more different thickness and width*
LCP Film

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Thermotropic Liquid Crystalline Polyester Film

User is responsible for determining whether the KGK product is fit for a particular purpose and suitable for user's method of application. Please remember that many factors can affect the use and performance of a KGK product in a particular application. The materials to be bonded with the product, the surface preparation of those materials, the product selected for use, the conditions in which the product is used, and the time and environmental conditions in which the product is expected to perform are among the many factors that can affect the use and performance of a KGK product. Given the variety of factors that can affect the use and performance of a KGK product, some of which are uniquely within the user's knowledge and control. It is essential that the user evaluate the KGK product to determine whether it is fit for a particular purpose and suitable for the user's method of application. KGK make no warranties on above data.

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