Low K material

What is K?
K is dielectric constant or permittivity

Why is low-K material needed?
• Parasitic capacitance unavoidable by OLED emitting layer
• Improving touch sensitivity by removing accumulated capacitance
• Low-K material desirable for TFE layer

Requirements for low-K dielectrics in electronic device

Common requirements
• Low K : 2.4X~2.5X
• Low viscosity : <20 cp @ 25°C, recommend 12~20 cp @ 25°C
• Inkjet process
• Good UV curability: 1 J/cm² by 395nm LED
• Solvent free
• Optically clear
• Hardness: Durable under CVD conditions
• Reliability: No out gas, no delamination, no bleeding
• Precise RI control

Why silicone?
• Excellent reliability
• Low shrinkage for planarization
• Good wettability for ink-jetting process
• Flexibility for foldable display

Compositional impacts and properties

Dielectric constant is a function of multiple parameters
• Increase cross linking density, which also increase Dk value
• We use special acrylate functional silicones and get very low Dk value

Low-K material properties

Cure condition: UV 1,000mJ/cm² @395nm (under N₂)

<table>
<thead>
<tr>
<th>Properties</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viscosity (cp)</td>
<td>Room temp.</td>
</tr>
<tr>
<td>Surface tension (mN/m)</td>
<td>25.90</td>
</tr>
<tr>
<td>Cure Degree (%) by FT-IR</td>
<td>&gt;95.00%</td>
</tr>
<tr>
<td>Dielectric Constant (25°C, 100KHz)</td>
<td>ITO + Ag electrode</td>
</tr>
<tr>
<td>Modulus G' (MPas, 25°C)</td>
<td>25°C</td>
</tr>
<tr>
<td></td>
<td>640</td>
</tr>
<tr>
<td></td>
<td>70°C</td>
</tr>
<tr>
<td></td>
<td>36</td>
</tr>
<tr>
<td>Refractive index</td>
<td>Liquid</td>
</tr>
<tr>
<td></td>
<td>1.48</td>
</tr>
<tr>
<td></td>
<td>Cured</td>
</tr>
<tr>
<td></td>
<td>1.50</td>
</tr>
<tr>
<td>Haze</td>
<td>8um thickness</td>
</tr>
<tr>
<td></td>
<td>&lt;0.2</td>
</tr>
<tr>
<td>Transmittance (380~740nm average, %)</td>
<td>8um thickness</td>
</tr>
<tr>
<td></td>
<td>&gt;99%</td>
</tr>
</tbody>
</table>
Reliability test result

No crack and color change

Glass type: Bare glass
Test condition: 85°C/85%
240h reliability test

Glass type: SiNx glass
Test condition: 85°C/85%
240h reliability test

Glass type: SiNx glass
Test condition: 85°C/85%
240h reliability test

Inkjet test

- Substrate: SiNx glass
- Inkjet head: KM 1024 head, droplet size: 25pL.

Jet-ability

No tailing, no satellite

Wettability

Dot test
Line test
Coating test

No tailing, no satellite

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