AGC Glass Technology Solution to Highly Functional Display Needs

Takahiro IKEZAKI
Vice President
Electronics Glass General Division, AGC Electronics, Asahi Glass Co., Ltd.

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✓ AGC Strengths
✓ AGC Display-Related Products Lineups
✓ AGC Technology Differentiators for Displays
-Contents-
✓ AGC strengths
✓ AGC Display-Related Products Lineups
✓ AGC Technology Differentiators for Displays
AGC Strengths

Advanced Glass Technologies
- Glass Compositions
- Processing Technology

Synergy of Core Technologies
- Glass Technology
- Chemical Technology
- Ceramics Technology

Experience in Wide Industries
- Display
- Automotive
- Architectural
- Electronics

Utilize our strengths for the future display industry.
Global Market Position

AGC

1

No. 1

Flat Glass
Glass for PDP
Glass for LTPS TFT
Glass for AMOLED
Glass for P. C. Touch Screen

Automotive Glass
Solar Power System Glass

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What is AGC’s Technological Advantage?

Glass compositions
- Alkali free glass
- High strain point glass
- Aluminosilicate glass
- Soda lime glass

Processing technology
- AGC’s Float Technology
- Larger size
- Thin/Ultra-thin
- Robust
- 2.5D/3D glass forming
- Surface coating
- Polishing
- Multiple function

Glass Design
- Mechanical
- Physical
- Optical
- Chemical

AGC’s solution for display and peripherals applications
-Contents-
✓ AGC strengths
✓ AGC Display-Related Products Lineups
✓ AGC Technology Differentiators for Displays
Smartphone

- **Cover Glass**
- **Anti Fingerprint Coating**
- **Touch Screen**
- **Ultra Thin Glass**
- **TFT-LCD /OLED Glass Substrate**

- **Electro Printable Materials etc**
- **Glass Frit Laser Seal for OLED**
- **2.5D/3D-Glass Chassis**
- **Visibility Compensation Filter for Camera module**

- **EPRIMA®AL-X6**
  - Gate Insulation
- **EPRIMA® Cu Paste**
  - Conductive paste
- **Glass for Photomask**

- **EPRIMA®AL-X6**

- **AS Thin glass**
  - CARBOGLASS®

- **Dragontrail®**

- **AN100**

- **NF-50 series**

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CARBOGLASS®
Polycarbonate film

Light Diffuser, BEF

EPRIMA®AL-X6
Gate Insulation
EPRIMA® Cu Paste
Conductive paste
Glass for Photomask

Electro Printable Materials etc

FONTEX®
Plastic Optical Fiber

Glass Frit Laser Seal for OLED

AN100
Ultra Thin Glass
PD200

TFT-LCD /PDP/OLED Glass Substrate

Designed Front Panel

Dragontrail®
CARBOGLASS®

AR coating
Fluoropolymer for Moth-eye

Anti Reflection Film/Coating
-Contents-

✓ AGC strengths
✓ AGC Display-Related Products Lineups
✓ AGC Technology Differentiators for Displays
Solutions by Glass Materials

Glass Processing Technologies
- Cutting for chemically strengthened Glass
- Fine precision drilling for thin glass
- Lapping and polishing
- Rolling for thin glass

Glass Surface Technologies
- Anti-reflection coating
- Anti-glare coating
- Anti-fingerprint coating
- Nano-scale texture by nanoimprint lithography
- ITO coating

Glass Forming Technologies
- Molding
- Bending
- 3D precise pressing

Glass Composite Technologies
- Laminated substrate
- Glass frit laser seal
- Cu hybrid conductive paste

AGC provides [Glass] & [Glass plus] solutions
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AGC provides [Glass] & [Glass plus] solutions
Concept of Form Factor Improvement

- Thinner Glass Substrate
  - 0.1mm AN Glass substrate
  - 0.4mm CG Glass substrate (Dragontrail)

- Touch function integrated
  - LCD cell
  - Optimize processability for Cover Glass
  - Thinner glass substrate
Conventional Process Flow for Cover Glass

Cutting process is after chemically-strengthen.

- Difficult Cutting
- Weaker Edge-Strength

2in1 (Combination with CG and TS)
Chemically-strengthened glass cutting method

Difficult cutting area by conventional cutting method

AGC developed cutting technology for High DOL

Cutting Criteria

Area of Cover Glass

High DOL

Low DOL

Touch Sensor of Soda Glass

Available by conventional cutting method
(Wheel or CO₂ laser)

Current 2in1 Low DOL
New Cutting Technology for High DOL

Glass: High-DOL Dragontrail (0.7mmt)
CS condition: CS=762MPa, DOL=40μm, CT=49MPa
Cutting: AGC new cutting technology

- High-DOL available (ex. >30um@0.7mmt)
- Direct corner forming
- Crack-less & vertical edge
- No glass cullet

Ref: Mechanical Process

Crack-less edge after cutting

Size 70mm * 100mm
AGC provides [Glass] & [Glass plus] solutions
Ultra Thin Glass
: World’s Thinnest Glass by Float Process

Rolled UTG Solutions
Carrier Glass attached UTG (Under Development)

Ultra thin glass (UTG) 0.1mm, 0.2mm
Proprietary bonding media layer

Carrier glass 0.5mm

- High thermal durability (High Temp.)
- High chemical durability
- Proper adhesion property

Carrier glass attached UTG
Laminating 0.1(0.2)mm ultra-thin glass for easy handling without changing the current process

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<table>
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<th>Glass Processing Technologies</th>
<th>Glass Surface Technologies</th>
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<tr>
<td>- Cutting for chemically</td>
<td>- Anti-reflection coating</td>
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<tr>
<td>strengthened Glass</td>
<td>- Anti-glare coating</td>
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<td>- Fine precision drilling for</td>
<td>- Anti-fingerprint coating</td>
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<tr>
<td>thin glass</td>
<td>- Nano-scale texture by</td>
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<tr>
<td>- Lapping and polishing</td>
<td>nanoimprint liteography</td>
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<td>- Rolling for thin glass</td>
<td>- ITO coating</td>
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<th>Glass Forming Technologies</th>
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<td>- Bending</td>
<td>- Glass frit laser seal</td>
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<tr>
<td>- 3D precise pressing</td>
<td>- Cu hybrid conductive paste</td>
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AGC provides [Glass] & [Glass plus] solutions
# AGC Forming Products

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<tr>
<th></th>
<th>MP</th>
<th>R&amp;D</th>
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<tbody>
<tr>
<td><strong>3D</strong></td>
<td><img src="image1.png" alt="3D MP Image" /></td>
<td><img src="image2.png" alt="3D R&amp;D Image" /></td>
</tr>
<tr>
<td><strong>2.5D</strong></td>
<td><img src="image3.png" alt="2.5D MP Image" /></td>
<td><img src="image4.png" alt="2.5D R&amp;D Image" /></td>
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*Currently under R&D for Mobile devices*
# Glass Forming Technology for Mobile devices Chassis

## Shape Details

<table>
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<th>Shape</th>
<th>Details</th>
<th>Images</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5D</td>
<td>Curved surface &amp; Flat surface</td>
<td><img src="image1" alt="Image" /> <img src="image2" alt="Image" /></td>
</tr>
<tr>
<td>3D</td>
<td>2 side Bending shape</td>
<td><img src="image3" alt="Image" /> <img src="image4" alt="Image" /></td>
</tr>
<tr>
<td>3D</td>
<td>4 side Bending shape</td>
<td><img src="image5" alt="Image" /> <img src="image6" alt="Image" /></td>
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</tbody>
</table>

Glass material: Dragontrail
Be able to provide samples
Solutions by Glass Materials

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AGC provides [Glass] & [Glass plus] solutions
Features of AGC’s AFP Film Coating

1) Highly durable AFP films
   ✔ Totally optimized processes from cutting to AFP coating on Dragontrail™
   ✔ High durability and reliability

2) Excellent productivities
   ✔ Coating on large-size mother glasses
   ✔ Markedly high productivity

3) Coating on glasses of various size
   ✔ Applicable to variations of cover glass process
   ✔ Cost reduction of the production line of cover glasses at customers’ sites

- **Mech. Durability**
- **Process cost**

![Graph showing contact angle vs rubbing times for different devices](image)

Test Condition
- Cotton cloth
- Load: 1000g/cm²
- Speed: 6400mm/min

Typical plot showing durability comparison of AGC-AFP film vs other brands.
What makes AGC different?

• Technological and business platform in wide variety of business segment
• Glass manufacturing and processing technologies for display and peripherals applications
• Many excellent products


Your Ideal Business Partner
Please visit our booth # 837
We look forward to talking to you