Battery *POUCH for Secondary Battery (Li-Polymer)*

 CONTENTS

- Company Introduction
- Manufacturer Introduction
- Pouch Structure Design
- Feature & Composition
- Production Progress Design
- Feature per each layer
- Physical & Chemical Property
- Quality Control
Manufacturer

- The manufacturer is leading new paradigm of the society, culture, environment in the 21st century, and pursuing the product for customer’s health and happiness and the perfection in any change. The manufacturer has been leading the spearhead of the packaging industry through innovative technological development and aggressive investment on plant facilities since the establishment in 1973.

- We are operating 5 factories with the pride of the newest and large facilities and the R&D institute, and the infrastructure CIM system for the fastest business efficiency, serving quickly and completely all procedures from order to production & delivery.

- As total maker in the plastic packaging field with Flexible Packaging, BOPP Film, Corrugated Cardboard, Carrier Tape, Laminated Tube, PP Shrink Film, we’re doing our best to develop high-tech products for future and the product for the harmony with environment.

Battery POUCH for Secondary Battery (Li-Polymer)
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Pouch Structure Design

1. The main check point in the design of the plastic pouch
   ① Hygiene
   ② Property for printing (Printing method, Ink, etc.)
   ③ Barrier (OTR, WTR, etc)
   ④ Property for processing (Laminating method, 
      The physical & chemical property after being laminated)
   ⑤ Packing property in line (Slop(Feeding), Heat sealing, etc)
   ⑥ Convenience for customer & user (Display, Opening, Re-deposit)
   ⑦ Economics (Production efficiency, Price, etc)

Secondary Battery component & characteristics
* Solvent(EC, DEC, DMC, etc)
* LiPF6 strong acid
* Embossing pack (Max 8.0mm)
* Distribution term: about 3 years
* Need: High Barrier, Thermal resistance & anticorrosive

1) Type & shape of product
2) Packaging machine
3) Packaging form
4) Distribution term & way

Secondary Battery Packaging
Forming: OPA(Oriented Polyamide)
Barrier: Al-foil
Anticorrosive: PP or PE
Thermal resistance: PP
**Battery POUCH for Secondary Battery (Li-Polymer)**

**FEATURE**

- Superior insulation property
- Excellent thermal resistance property (160°C)
- Good anti-chemicals (excellent anti-corrosive)
- Predominant heat sealing strength
- Excellent forming property

**POUCH Structure of Grade YCG-ALPA40j**

- ONy Film
- Al Foil
- PP Extrusion Coating
- CPP Film

- Adhesive
- Anti-corrosive
- AC for PP Coating
- Ozone treatment
Battery POUCH for Secondary Battery (Li-Polymer)

FEATURE

※ Superior insulation property
※ Excellent thermal resistance property (160°C)
※ Good anti-chemicals (excellent anti-corrosive)
※ Predominant heat sealing strength
※ Excellent forming property
※ Excellent resistance performance from electrolyte

POUCH Structure of Grade YCG-ALPA40U
Production Process of Pouch Film

**SD01, SD02**
Solvent free laminating

**CO01 (Coating)**
Coating with the medicine interrupting the surface activation of Al-Foil and more improved anticorrosive property

**CO02**
Coating the adhesive to laminate Al-Foil and PP

**EC01**
Extrusion coating between Al-Foil and CPP Film with the extruded PP, Ozone treatment in the extruded PP to improve the adhesive strength

**SL01**
Slitting the film in compliance with the inquiry of customer

Every films are laminated with adhesive (PET+Ny+Al-Foil)
Battery POUCH for Secondary Battery (Li-Polymer)

Feature by each layer

- **Base Film**: Laminating PET FILM for excellent surface protection and anti-electrolytic property
- **Adhesive 1**: PU line adhesive for excellent thermal resistance (Heat Resistant = 260 °C 10 sec) and anti-chemicals
- **ONy**: Oriented Polyanide(ONy) Film for excellent form processing property
- **Adhesive 2**: PU line adhesive for excellent thermal resistance (Heat Resistant = 260 °C 10 sec) and anti-chemicals
- **Al-Foil**: Excellent forming property, High Barrier
- **ANTI CORROSI VE**: Interrupting the surface activation of Al-Foil and increasing anticorrosive property
- **Adhesive 2**: PP line Adhesive for excellent insulation property and excellent adhesive strength with metal
- **Sealant Layer**: CPP Film (Hbno PP + Co-polymer PP + PE) for excellent heat sealing strength, Excellent thermal resistance property (Tm160°C) Excellent anti-chemicals (ANTI CORROSI VE), Good Slip, Nb white change situation when being processed
## Battery POUCH for Secondary Battery (Li-Polymer)

### PHYSICAL PROPERTY

<table>
<thead>
<tr>
<th>Property</th>
<th>Unit</th>
<th>YCC-ALPA50J</th>
<th>YCC-ALPA40U</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thickness</td>
<td></td>
<td>122.2</td>
<td>107.2</td>
<td>* Feature: excellent insulation property on surface</td>
</tr>
<tr>
<td>Breaking Factor</td>
<td>MD Kgf/mm²</td>
<td>16.1</td>
<td>8.08</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TD Kgf/mm²</td>
<td>15.2</td>
<td>8.27</td>
<td></td>
</tr>
<tr>
<td>Elongation</td>
<td>MD %</td>
<td>90.83</td>
<td>82.92</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TD %</td>
<td>86.00</td>
<td>73.75</td>
<td></td>
</tr>
<tr>
<td>Heat Sealing</td>
<td>170°C gf/15mm</td>
<td>3.5</td>
<td>3.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>180°C gf/15mm</td>
<td>4.2</td>
<td>3.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>190°C gf/15mm</td>
<td>4.5</td>
<td>4.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>200°C gf/15mm</td>
<td>4.8</td>
<td>4.9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>210°C gf/15mm</td>
<td>4.6</td>
<td>4.5</td>
<td></td>
</tr>
<tr>
<td>Puncture</td>
<td>kgf</td>
<td>8.5</td>
<td>6.8</td>
<td></td>
</tr>
<tr>
<td>Moisture Vapor Transmission Ratio</td>
<td>g/100in²/day</td>
<td>0.000</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>Oxygen Transmission Ratio</td>
<td>cc/100in²/day</td>
<td>0.000</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>Surface Resistivity (Sealant Layer)</td>
<td>Ω/cm²</td>
<td>10^{17}</td>
<td>10^{17}</td>
<td></td>
</tr>
</tbody>
</table>

### CHEMICAL PROPERTY

- Anti-electrolyte property: No de-lamination in the sealant layer in the electrolyte at 85°C for over 72hr

### FORMING PROPERTY

- No trouble over 6mm in our forming machine
Typical forming measurement of Cell Pouch

Being able to forming to max. 8mm depth

Pouch Film thickness
112~123
Forming Process & Equipment

The position of ① is expanded more than the position of ②.

Keep the most excellent surface illumination.
QUALITY CONTROL

※ ISO 9002 CERTIFICATION: 1997
※ QUALITY Check:
   1) Forming property: YCC Method
      - Possible over 7mm
   2) Heat Seal: ASTM F88-89
   3) Barrier: YCC Method (MVTR, OTR)
   4) Delamination in electrolyte
      : YCC Method (Electrolyte Precipitation Test)
      - Checking the sealant delamination after precipitating in the electrolyte at 60°C and 85°C
   5) GENERAL PROPERTY
      - Raw material inspection, Process inspection
      , Final inspection, Inspection before delivery
### Physical Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Unit</th>
<th>Value (YCC- ALPA)</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>40U</td>
<td>50J</td>
</tr>
<tr>
<td>Thickness</td>
<td></td>
<td>107.2</td>
<td>122.2</td>
</tr>
<tr>
<td>Breaking Factor</td>
<td>MD, kgf/15mm</td>
<td>13.0</td>
<td>13.9</td>
</tr>
<tr>
<td></td>
<td>TD</td>
<td>13.3</td>
<td>15.0</td>
</tr>
<tr>
<td>Elongation</td>
<td>MD, %</td>
<td>82.92</td>
<td>90.83</td>
</tr>
<tr>
<td></td>
<td>TD</td>
<td>73.75</td>
<td>86.00</td>
</tr>
<tr>
<td>Strength</td>
<td></td>
<td>3.5</td>
<td>3.5</td>
</tr>
<tr>
<td>Heat Sealing</td>
<td>170°C, kgf/15mm</td>
<td>3.8</td>
<td>4.2</td>
</tr>
<tr>
<td></td>
<td>180°C</td>
<td>3.8</td>
<td>4.2</td>
</tr>
<tr>
<td></td>
<td>190°C Press strength: 2kgf/cm²</td>
<td>4.5</td>
<td>4.5</td>
</tr>
<tr>
<td></td>
<td>200°C</td>
<td>4.9</td>
<td>4.8</td>
</tr>
<tr>
<td></td>
<td>210°C</td>
<td>4.5</td>
<td>4.6</td>
</tr>
<tr>
<td>Moisture Vapor Transmission Ratio</td>
<td>g/100in²/day</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Oxygen Transmission Ratio</td>
<td>cc/100in²/day</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Surface Resistivity (Sealant Layer)</td>
<td>Ω/cm²</td>
<td>$10^{17}$</td>
<td>$10^{17}$</td>
</tr>
</tbody>
</table>
Physical Properties Check Method and Standard

* **General Physical Properties**: YCC Method
  1) Thickness: measure the thickness of laminated film by micrometer
  2) Width: measure the width of the film on the last process by Vernier Calipers
  3) Length: measure the length of the film on the last process by Tachometer

* **Physical Strength**: ASTM D- 882(tensile strength elongation), ASTM D- 1004(tear strength), ASTM F- 1249(MVTR), ASTM D- 3985(OTR)
  1) Tensile Strength Elongation: Strength and Elongation of laminated film to fracture
  2) Tear strength: after rend off pouch film partly, check the strength to be torn again
  3) MVTR, OTR: Transmission Ratio of Moisture Vapor and Oxygen of laminated film

* **Sealant Layer Properties**: ASTM D- 257(surface resistivity), ASTM D- 1238(MFR), ASTM F- 1249(MVTR), ASTM D- 882(De- Lamination)
  1) Surface Resistance: electrical properties of Sealant Layer about Insulation Resistance and Surface Resistance
  2) MFR(Melt Flow Rate): Flow rate of Sealant Layer by temperature
  3) MVTR: Moisture Vapor Transmission Ratio of Sealant Layer
  4) De- Lamination: Test the possibility of separation between Sealant Layer and Al- Foil

* **Chemical Property**: YCC Method
  1) Dipping Test: De- lamination property of Selant Layer of Laminated Film when the pouch film dip in the electrolyte under the condition of 60°C and 85%RH
  2) Electrolyte Injection Test: De- lamination rate of Selant Layer after injection of electrolyte

* **Visual Test**: YCC Method
  1) Dust and alien substance: Visual testing dust of the inside/outside of pouch film surface
  2) Fish Eye: Visual testing “Fish Eye” phenomenon of Sealant Layer
# Physical Properties Check Method and Standard

<table>
<thead>
<tr>
<th>Item</th>
<th>Spec</th>
<th>Test method</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dimension</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thickness</td>
<td>223 ± 12µ</td>
<td>Micrometer</td>
</tr>
<tr>
<td>Width</td>
<td>266 ± 1mm</td>
<td>Vernier Calipers</td>
</tr>
<tr>
<td>Length</td>
<td>400 ±5, -0m</td>
<td>Tachometer</td>
</tr>
<tr>
<td><strong>Heat Seal strength</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>more than 3.5 kgf/15mm</td>
<td>ASTM F88-85</td>
</tr>
<tr>
<td><strong>Extrusion property</strong></td>
<td>No Pin-Hole when checking with laser after forming by testing machine of this company</td>
<td>Visual Testing</td>
</tr>
<tr>
<td><strong>Core (Plastic)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inside diameter</td>
<td>6 inch</td>
<td>Visual Testing</td>
</tr>
<tr>
<td>Thickness</td>
<td>10mm</td>
<td>Visual Testing</td>
</tr>
<tr>
<td><strong>Tape Attachment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>control two and below</td>
<td>Visual Testing</td>
</tr>
<tr>
<td>Method</td>
<td>attach with red tape</td>
<td>Visual Testing</td>
</tr>
<tr>
<td><strong>Appearance</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No crack of Aluminum, No Pin-Hole</td>
<td></td>
<td>Visual Testing</td>
</tr>
<tr>
<td>No dust inside and on the surface</td>
<td></td>
<td>Visual Testing</td>
</tr>
<tr>
<td>within 1.0mm Fish Eye of CPP</td>
<td></td>
<td>Visual Testing</td>
</tr>
<tr>
<td>No creases</td>
<td></td>
<td>Visual Testing</td>
</tr>
<tr>
<td>Control transverse offset within 1mm</td>
<td></td>
<td>Visual Testing</td>
</tr>
<tr>
<td>wind Ny to appear outside</td>
<td></td>
<td>Visual Testing</td>
</tr>
</tbody>
</table>
1. [Temperature/Condition] [23°C/°C]
2. [Humidity] [50%RH]
3. [Other Conditions]
4. [Handling]

Sony® Li-Polymer 2 Cell POUCH

**Cell** : Winding Type

**Pouch** : DNP

**Tab Film** : Pouch Cell

**Dimensions** : 38 34 56, 50 37 59