Business Presentation for Electronic Materials Business

December 18, 2015
FUJIFILM Electronic Materials Co., Ltd.

Business Fields of Fujifilm Group

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### Performance Summary of FY2016/3 1H

(Billions of yen)

<table>
<thead>
<tr>
<th></th>
<th>FY2015/3 1H</th>
<th>FY2016/3 1H</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Revenue</strong></td>
<td>1,182.9</td>
<td>1,226.1</td>
<td>43.2</td>
</tr>
<tr>
<td></td>
<td>100.0%</td>
<td>100.0%</td>
<td>+3.6%</td>
</tr>
</tbody>
</table>

### Revenue 1H

(Billions of yen)

<table>
<thead>
<tr>
<th></th>
<th>FY2015/3</th>
<th>FY2016/3</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Healthcare</strong></td>
<td>173.4</td>
<td>192.0</td>
<td>18.6 (+10.7%)</td>
</tr>
<tr>
<td><strong>FPD Materials</strong></td>
<td>64.7</td>
<td>45.6</td>
<td>(19.1) (-29.5%)</td>
</tr>
<tr>
<td><strong>Industrial Products</strong></td>
<td>43.0</td>
<td>52.2</td>
<td>9.2 (+21.5%)</td>
</tr>
<tr>
<td><strong>Electronic Materials</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Highly Functional Materials</strong></td>
<td>107.7</td>
<td>97.8</td>
<td>(9.9) (-9.2%)</td>
</tr>
<tr>
<td><strong>Recording Media</strong></td>
<td>22.4</td>
<td>21.8</td>
<td>(0.6) (-2.3%)</td>
</tr>
<tr>
<td><strong>Graphic Systems</strong></td>
<td>137.0</td>
<td>145.5</td>
<td>8.5 (+6.2%)</td>
</tr>
<tr>
<td><strong>Others</strong></td>
<td>3.1</td>
<td>3.3</td>
<td>0.2 (+6.7%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>443.6</td>
<td>460.4</td>
<td>16.8 (+3.8%)</td>
</tr>
</tbody>
</table>
Fujifilm’s strength

Capability to develop new technologies and technologies to permit stable manufacturing
Work for “technology development” and “stable manufacturing” by utilizing Fujifilm’s development structure

- **Synthetic Organic Chemistry Laboratories**
  - Design and synthesize new highly functional compound
  - Necessary for developing materials for semiconductors

- **Analysis Technology Center**
  - Analysis and elucidation of compounds using leading-edge equipment
  - Necessary for designing functions

- **Production Engineering & Development Center**
  - Improve manufacturing efficiency and reduce costs by manufacturing technologies

- **EM Research Laboratories**
  - Develop highly functional products that meet the customer’s needs by utilizing Fujifilm’s technology networks

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Fujifilm’s strength

A field where Fujifilm’s technological strengths can be utilized = semiconductor materials

[Diagram showing various fields and technologies where Fujifilm excels, including healthcare, pharmaceuticals, medical, and graphics systems.]
Special features of FFEM

1) Development of advanced highly functional products
   • Fundamental technologies:
     - Capability to design and synthesize organic chemical compounds/polymers and to analyze
       phenomenon by corporate laboratories
   • Product development:
     - Capability to grasp customer needs and design/develop with speed and accuracy by on-site sales and
       divisional laboratories

2) Stable supply of leading-edge products with “Incident Free” (No HVM issue)
   • Stable and consistent manufacturing (control performance of raw materials/ management of manufacturing
     process)
   • Quality Assurance (QA) /Quality Control (QC) (action against change in daily performance, that is pursuing
     cause of disordered data/near accident and reacting promptly and accurately when problems occur)

3) Wide range of leading-edge high-value-added global products that meet customers’ needs
   • ArF resists, CMP slurries, cleaners/etchants, thin films

4) Win-win relationships with priority customers (to obtain reliance from customers)
   • Support commitment by the whole company, including top management, R&D, production, QA/QC, and
     sales (including on-site)

5) Global production and supply network and joint development structure

Establish win-win relationships by continuing the cycle below

Introduction of EM business
Growth of the EM business

History of the business

1983
Fuji-Hunt Electronics Technology, established as a joint-venture company between Fujifilm (FF) and Philip A. Hunt Chemical Corporation (currently Arch Chemicals), started the manufacture and sales of IC photoresists and such related products as developers in Japan and elsewhere in the East Asia region.

1988
FUJIFILM Electronic Materials (FFEM) started the business of color resists for LCDs, receiving patent rights from FF.

1991
FF started R&D of photoresists for semiconductors.

1996
FFEM established a manufacturing subsidiary in Taiwan.

2000
FFEM established a subsidiary in South Korea.

2003
FF established a laboratory for semiconductor materials.

2004
FFEM became a 100%-owned subsidiary of FF while FF purchased the major part of the Microelectronic Materials Div. of Arch Chemicals (a manufacturing base in Europe/U.S.A. and a sales base in Europe/the U.S.A./Asia)

2005
FF established the Electronic Materials Div.
Purchased 50% of stocks in Planar Solutions, a joint-venture company in the CMP slurry business between Wacker and Arch Chemicals, from Arch Chemicals.

2006
Integrated the development function of FFEM with FF’s laboratory for semiconductor materials and renamed it as the Electronic Materials Laboratory (reinforcement of the business).
Established a manufacturing subsidiary in China.

2008
Purchased ArF immersion-litho equipment.

2010
Made Planar Solutions, a manufacturing/sales company of CMP slurries, into a 100%-owned subsidiary.

2012
Established a manufacturing subsidiary in South Korea.

2015
Acquired the U.S. high-purity solvent manufacturer, Ultra Pure Solutions, Inc.
History of the business

Established in 1983

1997
FUJI-HUNT ELECTRONICS TECHNOLOGY

2001
FUJIFILM

2004
FUJIFILM FF 100% Subsidiary

2010
FUJIFILM
Ultra Pure Solutions

2015
FUJIFILM

FFEM (China)
FFEM (Germany)
FFEM (UK)
FFEM (France)
FFEM (Italy)
FFEM (Japan)
FFEM (China)
FFEM (HK)
FFEM (Taiwan)
FFEM (Singapore)
FFEM (Korea)
FEMK (Korea)
FFEM (USA)
FUJIFILM PLANAR SOLUTIONS
FUJIFILM ULTRA PURE SOLUTIONS

Global structure of EM business
Global structure of EM business

Manufacturing / Delivery/ Customer Support/ R&D

Group
- FEUS (USA)
- FEBE (Belgium)

Subsidiary
- FETW (Taiwan)
- FESZ (Suzhou)
- FEKR (Korea)
- FEMK (Korea)
- FEHK (Hong Kong)
- FESG (Singapore)
- PLNR(USA) FEUP(USA)

Sales / Customer Support
Manufacturing Site
R&D Center

Global manufacturing structure

Photoresists
TMAH Developers
Resist Edge-bead Removers
Polyimides
Photoresist Strippers / Cu PER Cleaners
Low-K CVD Precursors
Color Mosaic
CMP Cu/Ba
Cu PER Cleaners
Low-K CVD Precursors
Color Mosaic
CMP Cu/Ba
CMP Cu
A yardstick of miniaturization

1m 1mm 1μm 1nm

Hair 100μm
Dust 1μm

Advantages of FFEM

Growth Strategies
- Develop highly functional materials in a wide field using advanced technology developments
- Contribute to the development of the semiconductor industry through building win-win relationships with customers

Main Products for Growth

1. Photoresists
2. COLOR MOSAIC for Image Sensors (ISCM)
3. CMP slurries
4. Photolithography related materials
5. Etchants/Cleaners
6. Polyimide
Main Products with Growth

<table>
<thead>
<tr>
<th>Products</th>
<th>Growth Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>① Photoresists</td>
<td>Appeal to such distinctive technologies as NTI, which was originally developed, and introduce leading-edge ArF photoresists to major customers</td>
</tr>
<tr>
<td>② ISCM</td>
<td>Reinforce process support to existing customers and contribute to improving customers’ manufacturing efficiency</td>
</tr>
<tr>
<td></td>
<td>Maintain major market share by preventing competitors from entering the field</td>
</tr>
<tr>
<td></td>
<td>Expand business field through such new products as image sensor related materials</td>
</tr>
<tr>
<td>③ CMP slurries</td>
<td>Expand the market through promoting on-site business (manufacturing/sales support) while specializing in the development of leading-edge slurries by utilizing FFEM’s technologies, cost-competitiveness, and sales capabilities</td>
</tr>
<tr>
<td>④-1 Photolithography related materials</td>
<td>Promptly develop and supply products that satisfy customers and match the development of circuit patterning materials, accompanied by the progress of semiconductor devices, through the reinforcement of cooperation with customers</td>
</tr>
<tr>
<td>④-2 Etchants/Cleaners</td>
<td></td>
</tr>
<tr>
<td>⑤ Polyimide</td>
<td>Expand the applications such as new package with Low temperature cure polyimide</td>
</tr>
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Photoresists, Photolithography related materials

**ArF Immersion resists to Photolithography related materials**

- Specialize in the development of advanced photoresists and expand business in ArF immersion/top coat less (TCL) photoresists and photoresists for NTI.
- Expand business area from photoresists to NTI developers and other Photolithography related materials.

**Advantages of the Business**

- Local production, Implementation for QA/QC
  - Further raise customer satisfaction with on-site service
- Utilize technologies that realize high quality, stable supply, and high-volume manufacturing (analysis technologies and synthesis technologies)

**Future Measures**

- Expand business of ArF immersion/Multiple patterning by the delays of EUV’s starting up.
  ⇒ Expand sales volume of resists for EB mask by increase of using amounts of Photo masks.
  
  - Only ArF
  ⇒ Strengthen EB resists (The number of Photo masks are increasing)
  - Expand business of ArF (ArF resists for NTI)
  - Under layer products, KrF (thick film) and other products
COLOR MOSAIC for image sensors

**Expand business by maintaining leading market position**

- Achieved leading market share (over 80%) by launching products ahead of other companies
- Expand business for in-vehicle business (automatic driving) and security use with IR (infrared region) products, in addition to the RGB products.

**Advantages of the Business**

- Take advantage of microdispersion technologies of ultra-fine pigments and photopolymer technologies, spectra control technologies, developed in photoresist materials

**Future Measures**

- Aim to keep high market share of RGB and introduce new materials for new applications.
- Aim to achieve top share of new materials market.

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**CMP slurries**

**Provide leading-edge CMP slurries for Cu and barriers**

- Specialize in sales/development of leading-edge CMP slurries for Cu and barriers (Ba)
- Expanding business for HKMG from CMP slurries which only use for Cu/ Ba

**Advantages of the Business**

- Combine Fujifilm’s advanced technologies with FFEM’s leading-edge technologies for CMP slurries, including cost-competitiveness and sales capabilities

**Future Measures**

- Reinforce measures to react to customers’ needs and improve transport efficiency by establishing manufacturing sites in South Korea and Taiwan

Equally/Smoothly planarize wafer surface that has a mixture of various substances with different hardnesses
**Offer advanced materials that meet the progress of technologies**

**Advantages of the Business**

- Build relationships with major semiconductor manufacturing companies and offer materials that meet the needs of the customers’ operations.

**Future Measures**

- Promptly establish and introduce material development/process capabilities that meet the daily development of circuit patterning materials through cooperation with customers.

*As miniaturization proceeds, removing contaminants (the resin, metal, and other materials remaining after the wiring process that leads to defects) and further improving accuracy are becoming more and more necessary.*

Contaminants with the same size will become a critical problem as miniaturization proceeds.
Photoresists are indispensable for the manufacturing of ultrasmall circuit patterns. This photopolymer is used in the microphotolithography process, where the circuit pattern is printed onto a silicon wafer via exposure to light.

Pattern formation by lithography technology

Creating photomasks
A base used when transcribing circuit patterns to photoresist

Applying photoresists
Apply photoresist to silicon wafers

Exposing light
Print mask patterns on photoresist

Silicon wafer

Devising
Melt photoresist that has been exposed by using developer

Etching
Cut out parts that are not protected by photoresist

Note: As in the case of positive resist

New technologies are used to meet the needs for the further miniaturization of circuit dimension.

**ArF immersion**
A technology for increasing the resolution by filling the space between the stepper lens and the wafer with water that has a higher refractive index than air. This makes possible microprocessing without changing the light source or the photomask.

**Top coat less**
In the case of immersion, a topcoat is necessary to prevent elution into the water contained in the resist. With “top coat less” technology, the need for a topcoat is eliminated at the time of the exposure because polarity conversion technology changes the hydrophobic resist surface to a hydrophilic surface when development takes place.

**Negative tone imaging (NTI)**
Uses negative developing, a system that the exposed part is left. It realizes further miniaturization compared with the positive developing system, while shorting tact-time through its high sensitiveness.
**Materials for image sensors**

**Color resists**
A photo-sensitized coloring material to manufacture micro color filters, used in image sensors.

![Color resists diagram]

**Smart phone**
**Digital camera**

Products that use image sensors

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**Back-end materials and others**

**CMP (chemical mechanical polishing) slurry**
An abrasive material used to planarize the substrate that has various materials in the circuit structure, like metal or dielectrics, to the ultimate level.

- **Forming wiring**
  - Form electrode wiring after removing photoresist

- **Planarization**
  - Abrade and planarize the rough field of wafer

**Cleaner**
A cleaner used for clearing substrates and removing impurities. It is used several times during the process of manufacturing semiconductors.

**Products for thin film deposition**
Insulator materials providing a low dielectric (Low-k). It prevents reduction of the device operation speed or an increase in the power consumption, caused by the reduction in the size of the wiring line and the insulator in between the lines.

**Polyimide Products**
Polyimides are widely used as an electronic material in various applications. They have such characteristics as high thermal durability and good insulation properties.