Characterization of CMP Consumables by Fundamental Understandings of its Process

JSR Corporation
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## Semiconductor Manufacturing Trend

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<tbody>
<tr>
<td>ITRS logic-M1</td>
<td>38</td>
<td>32</td>
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<td><strong>24</strong></td>
<td>22</td>
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<td>18</td>
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<td>15</td>
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### Wafer size
- 300mm
- 450mm

### Transistor
- High-k/Metal Gate
- FinFET
- 3D Memory

### Wiring
- ArF Imm. Lithography
- EUVL
- Co barrier/Cap
- DSAL
- New metal (Ru, Mn etc), barrier/Cap
- W wiring

### Wafer level
- 2D Package
- TSV (2.5D/3D)

### Package
- Fan out Pannell
- HDI PCB

### Print Board
### JSR Semiconductor Products

<table>
<thead>
<tr>
<th>Year</th>
<th>Resist Type</th>
<th>Applications</th>
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<tbody>
<tr>
<td>1980</td>
<td>g/i-line Resist</td>
<td>Lithography</td>
</tr>
<tr>
<td>1990</td>
<td>KrF Resist</td>
<td>Lithography, Packaging</td>
</tr>
<tr>
<td>2000</td>
<td>ArF Resist</td>
<td>Lithography, Packaging</td>
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<tr>
<td>2010</td>
<td>ArF Imm. Resist</td>
<td>Lithography, Packaging</td>
</tr>
<tr>
<td>2015</td>
<td>EUV Resist</td>
<td>Lithography, Packaging</td>
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**Si-ARC(Spin-On-Glass)/ SOH Materials**

**Top Coat Materials(TARC)**

**Imm. TC mat.(ITC)**

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**Lithography**

-CMP Pad
- BEOL Slurry
- ILD Slurry
- W Slurry ➔ FEOL
- pCuCMP Cleaner

**CMP**

**Packaging**

- Insulator
- Thick Resist

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Environment gap enlarges as the generation proceeds. Techniques to fill the gap is one of supplier’s differentiators.
When the customer’s requirements are broken down, electro-chemistry and surface chemistry are the important techniques for CMP.
Electro-Chemistry ~ Status understandings ~

There are many electro-chemistry techniques to understand various status and mechanism.

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Relation Between Electro-chemistry and CMP Results

**Example 1: Cu corrosion check**

Electro-chemistry is one of a key technology for defect reduction, removal rate prediction.

**Example 2: W removal rate**

Electro-chemistry is one of a key technology for defect reduction, removal rate prediction.
Surface Chemistry ~ And relation with CMP ~

Abrasive charge control

Substrate charge control

Pad charge control / understanding

Control of surface charge is one of a key technology for defect reduction, removal rate prediction.
Fundamental research or background data is proposed in addition to the general CMP performance data for smaller gap between customer and JSR.
Image of Collaboration Speed

With fundamental background data, increase of performance at the customer will be faster.
Many JSR products are approved for sale by using the fundamental data set method.
Summary

- JSR CMP consumables have fundamental background to fill the gap between the customer and JSR.
- This background will also relate quick update to customer which should also accelerate customer’s development.
  - Fundamental data for reasonable update with deep understandings
  - Quick turn-around without CMP data
  - Predicted results before CMP in JSR or at customer

Many JSR products are approved for sale by using the fundamental data set method.