The soaring gold price is accelerating the shift to copper bonding wire, allowing Cu wire bonding technology to make a dramatic progress in recent years. However, it is necessary to prepare an environment to generate inert gas indispensible for FAB formation in order to build a solid foundation to shift to Cu wire (i.e. Cu kit and infrastructure). Yet production-scale expansion is not an easy task to accomplish. In addition, change of materials (capillary and mold resin) is required to stabilize reliability and productivity, thus long-term preparation (evaluation) is vital before going to mass production. The trend of shift to Cu wire is expected to advance further in future, thus further improvement of bonding technique is indispensible as there are many issues to challenge such as handling of fragile Pad structure and low temperature bonding. Some of Shinkawa’s Cu wire bonding techniques are as follows.

【Applicable Wire Bonder Models】
UTC-2000Super, UTC-3000 & UTC-3000WE
Gas Chamber, a Cu component, is designed to blow in two directions. Besides, its simplified structure allows to check the Loop shape with ease.

1. Cu Components
The design of Gas Chamber is confirmed to provide stable FAB formation by checking the consistency between fluid analysis and verification run.

2. Check Consistency between Fluid Analysis and Verification Run on FAB Formation

The design of Gas Chamber is confirmed to provide stable FAB formation by checking the consistency between fluid analysis and verification run.
3. Proven Results of Cu Wire Bond

Proven results of Cu Wire Bond accumulated through practical experiences enable SHINKAWA to provide consulting and technical support services to customers.

- **Cu-Pd wire vs Cu wire**
  - Bonded ball and after shear test

- **Pd-Cu wire vs Cu wire**

- **Au wire vs Pd-Cu wire vs Cu wire**
  - 1st bond

Function to suppress the aluminum splash at Multi Step.

- **Comparison of Z Sink (Over Travel) Motion**
  - Comment:
    - *Z Sink is ON, ball thickness can be secured at US oscillation, but if Z Sink is OFF, Z encounters US oscillation, making it difficult to secure ball thickness.*
    - *Above photographs show SEM photos when it is combined with X Scrub.*
SHINKAWA offers special scrub functions indispensable for Cu wire bonding technique.

4-1. Special Function for Cu Wire Bond (Circular Scrub)

Solution of damage by 1st Bond factors

- Using Circle motion
  - To make lower US power, using circle motion for 1st bond.

Solution of damage by 2nd Bond

- Using Circle motion
  - To make lower US power, using circle motion.

Bonding Process Comparison

<table>
<thead>
<tr>
<th>Ball Size Measurements</th>
<th>Scrub (x)</th>
<th>Scrub (y)</th>
<th>Scrub (x+y)</th>
<th>Scrub Circular</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max</td>
<td>53.5</td>
<td>11</td>
<td>53.5</td>
<td>23.3</td>
</tr>
<tr>
<td>Min</td>
<td>52.0</td>
<td>9</td>
<td>51.5</td>
<td>19.0</td>
</tr>
<tr>
<td>Ave</td>
<td>53.1</td>
<td>10.1</td>
<td>52.3</td>
<td>20.9</td>
</tr>
<tr>
<td>Std</td>
<td>0.50</td>
<td>0.88</td>
<td>0.59</td>
<td>1.38</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pull Strength (Pull at lead)</th>
<th>Wire +</th>
<th>Wire -</th>
<th>Wire RA</th>
<th>Scrub Circular</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max</td>
<td>6.29</td>
<td>6.54</td>
<td>6.87</td>
<td>6.74</td>
</tr>
<tr>
<td>Min</td>
<td>5.82</td>
<td>5.55</td>
<td>5.42</td>
<td>5.44</td>
</tr>
<tr>
<td>Ave</td>
<td>6.02</td>
<td>6.15</td>
<td>6.02</td>
<td>6.03</td>
</tr>
<tr>
<td>Std</td>
<td>0.14</td>
<td>0.34</td>
<td>0.48</td>
<td>0.38</td>
</tr>
</tbody>
</table>

SHINKAWA LTD.
Besides, interconnection process is also important for Cu wire bonding technique, thus function capable of handling multistep process such as “M-Step” is also available to be incorporated. SHINKAWA continues to work on the development of special functions like above each day to offer to the customers and respond to their needs.
With “Producing Equipment Safe to Use” as the team goal, SHINKAWA is committed to continue developing equipment with enhanced portability and reliability. For details, please inquire our sales department.