Supporting Information for:

Stabilization of the Thermal Decomposition Process of Self-reducible Copper Ion Ink for Direct Printed Conductive Patterns

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Figure S1. Photographs of CuF-MIPA, CuF-MIPA-OA and CuF-MIPA-OA ink with 1 wt% PVP (CuF-IPA-OA-PVP ink). The ink over the wall is due to the stirring effect in the preparation process and nearly disappear after 20 minutes.
Figure S2. (a) XRD pattern of CuF-MIPA film sintered at 120 °C for 40 minutes under N₂ atmosphere. (b) XRD pattern of copper thin film obtained from calcination of CuF-MIPA-OA ink at 105 °C and 140 °C for 40 minutes.
Figure S3. Photographs of printed lines using CuF-MIPA ink calcined at 140 °C under N₂ atmosphere.
Figure S4. (a) The photography of thermal decomposition process of copper ink with different OA/MIPA ratio. The photo was taken when copper starts to nucleate. Variation of (b) bubble size and (c) number with OA/MIPA ratio.
Figure S5. Thermal decomposition process of CuF-IPA-OA film with different film thickness. The photograph was taken when copper starts to nucleate.
Figure S6. SEM images and particle size distributions at various OA/MIPA ratio. The particle size distributions are evaluated by image analysis from ImageJ software.
Figure S7. SEM images and particle size distributions of the CuF-MIPA-OA ink sintered at different calcination temperatures.
Figure S8. Photograph of a pen-writing copper thin film on PET. The inset picture shows the pattern before calcination.
Table S1. Comparison of characteristics with other copper MOD inks

<table>
<thead>
<tr>
<th>Author</th>
<th>Copper complexes</th>
<th>Sintering condition</th>
<th>Sintering time</th>
<th>Sintering atmosphere</th>
<th>Resistivity (μΩ-cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yabuki et al., 2011</td>
<td>CuF + octylamine</td>
<td>140°C</td>
<td>60 min</td>
<td>Nitrogen</td>
<td>20</td>
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<tr>
<td>Yabuki et al., 2012</td>
<td>CuF+ bibutylamine + octylamine</td>
<td>140°C</td>
<td>30 min</td>
<td>Nitrogen</td>
<td>5</td>
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<tr>
<td>Farraj et al., 2015</td>
<td>CuF+2-amino-2-methyl-1-propanol</td>
<td>190°C</td>
<td>9 min</td>
<td>Nitrogen</td>
<td>10.5</td>
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<tr>
<td>Yonezawa et al., 2016</td>
<td>CuF+isopropanol amine+Cu particle</td>
<td>100°C</td>
<td>1 hr</td>
<td>Nitrogen</td>
<td>900</td>
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<tr>
<td>Paquet et al., 2016</td>
<td>CuF+3-butylypyridine + 2-ethyl-1-hexylamine</td>
<td>135°C</td>
<td>5 min</td>
<td>Nitrogen</td>
<td>14</td>
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<tr>
<td>Li et al., 2016</td>
<td>CuF+2-amino-2-methyl-1-propanol+ Cu particle</td>
<td>140°C</td>
<td>15 min</td>
<td>Nitrogen</td>
<td>11.3</td>
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<td>Xu et al., 2016</td>
<td>CuF+butylamine + octylamine</td>
<td>160 °C</td>
<td>20 min</td>
<td>Vacuum</td>
<td>21.4</td>
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<tr>
<td>Yong et al., 2017</td>
<td>CuF+isopropanol amine+Cu particle</td>
<td>100°C</td>
<td>1 hr</td>
<td>Nitrogen</td>
<td>88</td>
</tr>
<tr>
<td>This work</td>
<td>CuF+ monoisopropanol amine+octylamine</td>
<td>140 °C</td>
<td>5 min</td>
<td>Nitrogen</td>
<td>20</td>
</tr>
</tbody>
</table>

References: