Highly Selective Metal Etchant for Titanium and Titanium Alloy Seed Layers

Titanium and titanium alloys are widely used in advanced packaging as adhesion and barrier seed layers. With FOWLP, Flip Chip, 2.5/3D and other technologies continuing to require increased functionality with smaller feature sizes, traditional metal etchants are reaching their limitations.

DHF, SC1, and pure H₂O₂ have been used for many years to etch titanium and titanium alloys. These traditional chemistries suffer from inconsistent etch rates, excessive undercuts, and low compatibility with metal stacks, and they are difficult to control. Because of these weaknesses, legacy chemistries cannot meet the current requirements of advanced packaging companies.

Working closely with our industry leading customers, Technic has successfully formulated a high-level metal etchant chemistry that eliminates many of the weaknesses of traditional titanium and titanium alloy etchants. TechniEtch TBR19 is a stabilized hydrogen peroxide based metal etchant that is extremely selective with a very low undercut value of < 0.2 microns.

Features
- Excellent selectivity
- Low undercut
- Improved etch uniformity
- Stable and consistent etch rate over the life of the bath
- Fluoride-free aqueous solution
- Compatible with most UBM and copper pillar integration materials
- Fully compatible with aluminum
- Tunable etch rate

Benefits
- High selectivity and low undercut provides high yields with fine pitch patterns
- Reduced cost of operation through extended bath life
- High process efficiency through stable chemistry and consistent etch rate
- Wide process operating window – 50% process overetch still results in minimal undercut
High Metal Selectivity

<table>
<thead>
<tr>
<th>Substrate</th>
<th>Etch Rate (Å/min)</th>
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</thead>
<tbody>
<tr>
<td>TiN PVD</td>
<td>1500</td>
</tr>
<tr>
<td>Ti PVD</td>
<td>1800</td>
</tr>
<tr>
<td>Cu ECD</td>
<td>&lt; 10</td>
</tr>
<tr>
<td>Sn ECD</td>
<td>&lt; 10</td>
</tr>
<tr>
<td>Al PVD</td>
<td>&lt; 10</td>
</tr>
<tr>
<td>Ni ECD</td>
<td>&lt; 10</td>
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</tbody>
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Standard Etch Rate at 50°C on full blanket substrates

Less than 10% reduction in etch rate at 50°C in a single wafer tool

Low undercut achieved after removal of 2000 Å of Ti from 300 mm wafer

Ti native oxide (TiO₂) dramatically reduces the Ti etch rate in pure H₂O₂. The excellent dissolution of TiO₂ in TBR19 enhances and promotes a fast etch rate throughout the process, leading to better etching uniformity and process control.