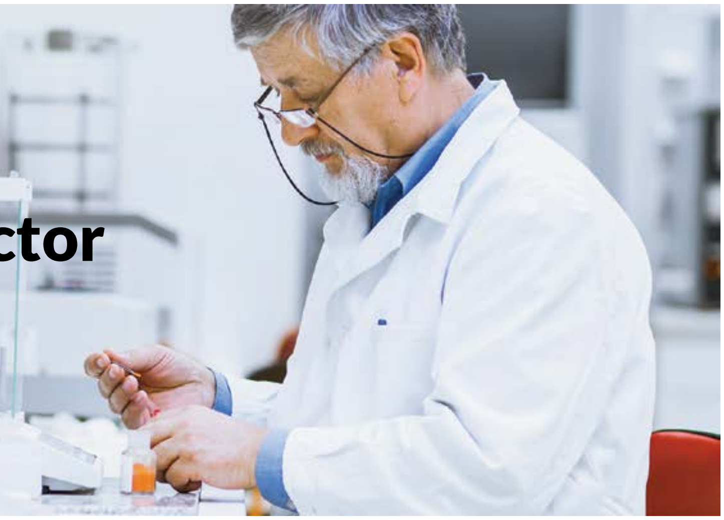
# Improve Your Semiconductor Test Reliability



RBP Chemical Technology, Milwaukee, Wisconsin

## Enhance your test reliability and reduce your costs significantly.

RBP has developed a suite of proprietary processes that will clean, deoxidize and restore the probes and test sockets without degrading or attacking the probes and sockets themselves. This allows the user to extend the life of these test fixtures (sockets) by 5-7 times. Thus, use of the RBP processes reduces the cost of ownership for testing of the assembled semiconductor package.

**Test sockets after repeated use**

## Semiconductor Test Fixture and Probe Card Restoration

RBP markets the specialized De-Ox and probe cleaning chemical processes which are designed to recondition and restore semi-conductor test sockets and probes to their pre-test condition. This allows the test operation to reuse the fixtures and probes multiple times longer. In addition, the RBP De-Ox and Probe cleaning processes only remove oxides that reduce test result inconsistencies without damaging the equipment, reducing the potential for false results, and extending the life of the sockets and probes by 60-80%.

**Test sockets are cleaned and restored with the RBP De-Ox process**

For more information:
**Mike Carano**
800-558-0747 ■ +1 414-258-0911
mcarano@rbpchemical.net

RBP Chemical Technology
150 S. 118th Street, Milwaukee, WI 53214 USA
**rbpchemical.com**

# It is About Test Reliability and Repeatability

## RBP's simple, yet effective solution for semiconductor test reliability and cost reduction.

Test probes, probe cards and sockets won't last forever. With RBP's proprietary and production proven technology, OSAT companies big and small, are able to restore these test fixtures and extend the useful life several times more than either mechanical methods or simply discarding the probes and sockets.

When wafer probes and sockets become loaded with oxide, it is now feasible to clean/renew them to essentially to their virgin state. This is done using specialty additives which convert the Aluminum and Copper oxide into soluble forms, which dissolve readily in RBP's specialty deox processes. In addition, RBP's chemistry not only cleans and renews probes, cards and sockets , the process contains special inhibitors to prevent the reoxidation of the metals. Unless this propensity to prevent reoxidation tarnishing is curbed, it will result in contact resistance building rapidly.

This re-oxidation can be avoided by including in the cleaner/renewing chemistry an organic anti-tarnish agent, which, properly chosen, protects the probe surface, without interfering with conductivity. Key words in the previous are "properly chosen", as the commonly known anti-tarnish agents (Triazoles and imidazoles) give thick multilayer coats, known to increase contact resistance.

What is needed is an agent which will react with the surface metal, and leave an insoluble mono-molecular coating, which reduces the potential of the surface metal to react with atmospheric Oxygen. This is no small feat, but has been achieved with RBP's suite of specialty deox and probe wash cleaning systems.

It is also important to note that the probes, cards and test sockets are not degraded by the cleaning process as is common with forms of cleaning.

**The resistance life limitation of the test boards/sockets has been extended several times more and at greatly reduced costs thanks to RBP's fully aqueous cleaning and deoxidation processes.**

For more information:
**Mike Carano**
800-558-0747 ■ +1 414-258-0911
mcarano@rbpchemical.net

RBP Chemical Technology
150 S. 118th Street, Milwaukee, WI 53214 USA
**rbpchemical.com**

# Probe Wash & Test Socket/Burn-in Board Restoration

## Enhancing test repeatability and reducing costs with RBP's suite of specialty chemicals for OSAT applications

**RBP Chemical Technology, Milwaukee, Wisconsin USA**

## Overview

Contact resistance on probes and test sockets is one of the largest factors in semiconductor package testing yield loss. Contact resistance increases as each probe and insertion are carried out. RBP Chemical Technology has determined that to improve electrical test performance and reduce the costs associated with testing, a non-destructive cleaning strategy is indicated.

However, before presenting RBP's technology, there are several important issues to consider. First, probes and tests sockets will wear out after so many insertions. In addition, OSAT firms that employ mechanical cleaning methods risk damage to the probes and sockets. While acknowledging that some cleaning is necessary, at some point the cost of ownership comes in to play. As an example, ineffective or infrequent cleaning leads to yield loss. Excessive or frequent mechanical cleaning leads to damage of the test probes and sockets. Therefore, RBP Chemical Technology has developed a suite of specialty chemical processes that will not cause any physical damage to the probes/sockets. But more on that later.

**Test sockets after repeated use**

**Test sockets are cleaned and restored with the RBP De-Ox process**

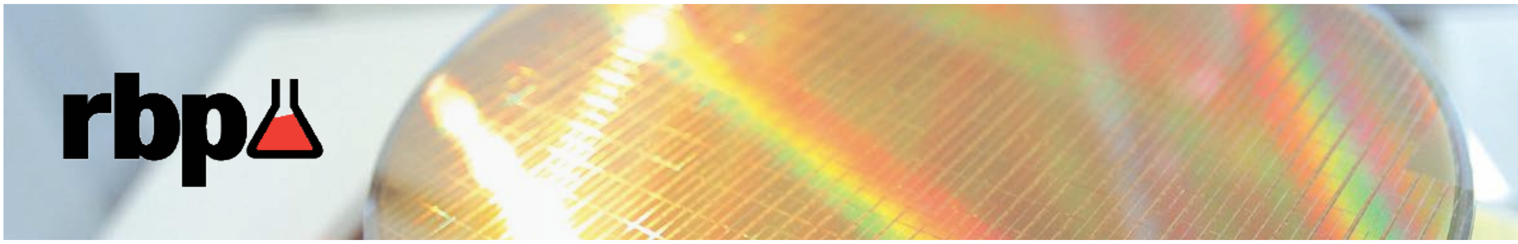
## What are the possible sources of contamination?

There are multiple opportunities for probes and sockets to be fouled thus reducing test reliability. The primary offenders are:

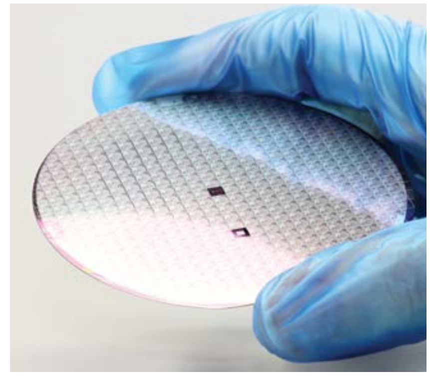
- Silicon nitride
- Passivation/oxidation
- Polymers and fluorocarbons
- Aluminum and tungsten oxide
- Oxide coating on gold contacts

Choose the method of cleaning carefully. Clearly understand the possible soils or contaminants on the probes and sockets and employ the method best suited for the operation. However, the optimum and most cost-effective method to restore probes and sockets is to use a specially designed chemical process to remove oxides and other contaminants without compromising the underlying probe and test socket as some non-chemical methods do. RBP Chemical Technology has multiple non-destructive processes for OSAT companies. *....continued on page 2*

For more information:
**Mike Carano**
800-558-0747 ■ +1 414-258-0911
mcarano@rbpchemical.net
RBP Chemical Technology
150 S. 118th Street, Milwaukee, WI 53214 USA
**rbpchemical.com**




## RBP's cost effective and reliable solution



When wafer probes become loaded with oxide, the engineer must make a choice-either find a way to clean the probe mechanically or simply replace the existing probes with new ones. This further increases costs. RBP Chemical Technology's team of scientists have developed unique chemical processes that will renew the probes to essentially virgin condition. This is accomplished using agents which convert the Aluminum and Copper oxide into soluble forms, which dissolve readily in the cleaner. However, the process of cleaning/renewing inevitably leaves the probe completely unprotected by any oxide layer, and thus prone to rapid/heavy tarnishing. Unless this propensity to tarnishing is curbed, it will result in contact resistance building rapidly.

This re-oxidation can be avoided by including in the cleaner/renewing chemistry an organic anti-tarnish agent, which, properly chosen, protects the probe surface, without interfering with conductivity. Key words in the previous sentence are "properly chosen", as the commonly known anti-tarnish agents (Triazoles and imidazoles) give thick multilayer coatings, known to increase contact resistance.

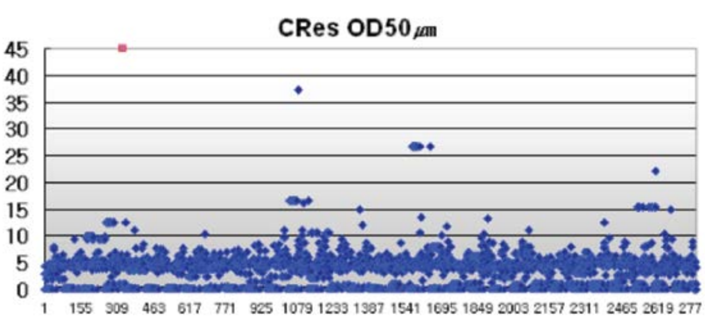
What is needed is an agent which will react with the surface metal, and leave an insoluble mono-molecular coating, which reduces the potential of the surface metal to react with atmospheric Oxygen. This is no small feat, but has been achieved, and results in a probe which acts like a new probe.

**When wafer probes become loaded with oxide, the engineer must make a choice-either find a way to clean the probe mechanically or simply replace the existing probes with new ones.**

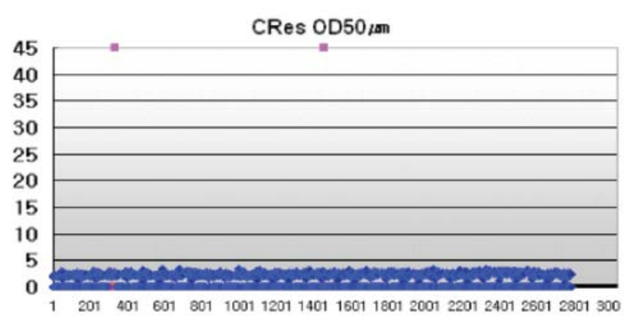
**The ProbeWash™ (RDZ-1730)** approach removes oxides chemically, not by physical abrasion. Since there is no abrasion of the probe, the contact points are not degraded by the cleaning process, and the surface is left protected by the anti-tarnish, so re-tarnishing is essentially halted.

### Contact Resistance on 50 µm Probes

**BEFORE - ProbeWash™ (RDZ-1730)**




**AFTER - ProbeWash™ (RDZ-1730)**




*....continued on page 3*

For more information:
Mike Carano
800-558-0747 ▪ +1 414-258-0911
mcarano@rbpchemical.net

RBP Chemical Technology
150 S. 118th Street, Milwaukee, WI 53214 USA
**rbpchemical.com**

# Test sockets and burn-in board restoration

In addition to the requirement to restore test probes without damaging them, there is another issue that RBP Chemical Technology has addressed for the benefit of the OSAT industry. The issue relates to test sockets and burn-in boards. The problem: Test/burn-in printed circuit boards are very expensive, and as they are used, the semiconductor connection sockets develop increasing contact resistance. The resistance increases to such an extent that after ± 5000 hours of use, the whole board may be discarded. This results in a very high cost per hour of use. The answer (one is tempted to say the "solution") to this problem is now available, and it is relatively easy, and inexpensive, thanks to RBP Chemical Technology's team of scientists and engineers.

Specifically, when test/burn-in printed circuit boards are new, the connectors should have a resistance of less than 10 ohms, and usually less than 3 ohms. Over time, because of picking up oxides from the leads of the semiconductors being tested, this resistance can increase to more than 50 ohms, at which point the connector/socket becomes unusable. When enough connectors go bad, the whole board is discarded, at a relatively significant cost.

> **The resistance life limitation of the test boards/sockets has been extended virtually indefinitely; the test boards will now fail from mechanical issues before they become unusable electronically, thus extending their life many times.**

This issue was initially addressed using a metal stripper, and although early results were promising, other problems were created, and it appeared to not be worth the effort to attempt a clean-up of the test sockets.

On further consideration, it was realized that the problem was caused by the oxides on the contacts, not the base metal, and the chemistry of the approach was refined to remove only oxides, without touching any actual metals. Specifically cleaned connectors show a consistent 3-ohm resistance or less. Further, the boards were then put into use, and lasted at least as long as new boards, before they needed to be cleaned again.

The resistance life limitation of the test boards/sockets has been extended virtually indefinitely; the test boards will now fail from mechanical issues before they become unusable electronically, thus extending their life many times.

How is this achieved? With an aqueous chemical wash, De-Ox™ (RDZ-1556) six minutes at 120° F, followed by a deionized water rinse and dry. For soldermask on burn-in boards of questionable quality, RBP has De-Ox II and De-Ox Ultra. These processes are also recommended for test sockets with exposed aluminum.

**This new approach will help in lowering costs and allowing the semiconductor industry to continue to deliver more technology for less money.**

## DE-OX™ / DE-OX II™ / DE-OX ULTRA
## FOR TEST SOCKETS & BURN-IN BOARDS

**Recommended process for cleaning test sockets with De-Ox, De-Ox II and De-Ox Ultra:**

1. Immerse or contact via sprays in 100% De-Ox™ solution for 6 minutes at 50° C (Alternate procedure is 100% of either chemical for 3 minutes at 60° C)
2. Rinse thoroughly in deionized water. (If using stagnant [non-flowing] rinses, use 3 rinses)
3. Dry, using low temperature clean air. (Do not use compressed air, this always has oil droplets, do not bake, this will cause oxide to re-form, and may damage plastic package) Preferred forced drying is to use hair dryer, set on low temperature.
4. If test socket has springs, actuate springs many times at each step, cleaning, rinsing, and drying, or increase dwell times in De-Ox solutions.

### Material Compatibility with De-Ox™ Product Line

| Material | De-Ox™ | De-Ox™ II | De-Ox™ Ultra |
|---|---|---|---|
| Stainless Steel | OK | May Discolor | May Discolor |
| Copper | OK | OK | OK |
| Peek (Carbon Filled) | OK | OK | OK |
| ULTEM | OK | OK | OK |
| EPDM | Do Not Use | OK | OK |
| Polyamide (Nylon) | Do Not Use | OK | OK |
| Polycarbonate | Do Not Use | OK | OK |
| Polyimide | Do Not Use | OK | OK |
| Torlon | Do Not Use | OK | OK |
| Vespal | Do Not Use | OK | OK |
| Aluminum | Do Not Use | OK | OK |
| Zinc | Do Not Use | Do Not Use | Do Not Use |

For more information:
Mike Carano
800-558-0747 ■ +1 414-258-0911
mcarano@rbpchemical.net

RBP Chemical Technology
150 S. 118th Street, Milwaukee, WI 53214 USA
rbpchemical.com