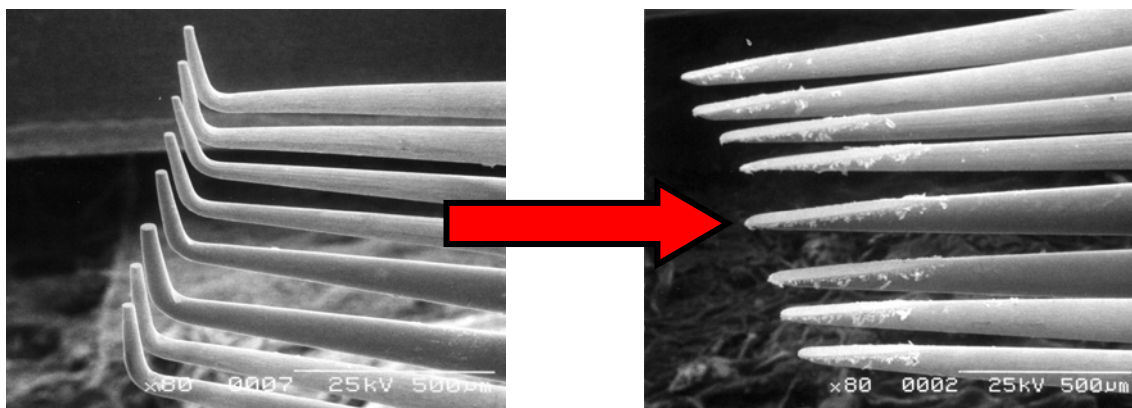


Non-destructive Cleaning to Maintain High Wafer Yield and Extend Probe Card Life

Low and stable (C_{RES}) contact resistance is critical for high wafer yields and avoiding reprobe to confirm the first-pass sort results. The most common method of controlling C_{RES} during wafer level testing is on-line abrasive cleaning to physically remove the contaminants from the contact surface. During abrasive cleaning, the probes are subjected to multiple touchdowns on alumina (aluminum oxide) lapping film (0.5, 1, 3, or 5- μm grit), a tungsten-carbide plate, or a ceramic block. Particulates, bond pad metal, or probe material from the previous cleanings can adhere to the probe tips and affect wafer yield. The tips are also subjected to frictional shear stresses and tip material is removed until the probes are out of specification. The result of extended abrasive cleaning methods applied to cantilevered probes is shown below.



Cantilever probe card.

Destructive cleaning with 3- μm grit alumina lapping film ("pink stuff")

Currently, many probe card technologies are built with materials that cannot withstand severe frictional shear loading or surface deformation against an abrasive pad. For these technologies a non-destructive, low impact cleaning technique that collects debris and cleans the contact surface is needed.

Probe Polish™ is a composite material developed to non-destructively clean flat, rounded, and radius cantilevered probe tips; vertical and area array probe card technologies with flat, pointed, and wedge style Cobra-style probes; and other advanced probe card technologies such as those built by FormFactor and Cascade MicroTech.

Probe Polish™ uses a highly cross-linked polymer which is non-conductive, non-corrosive, and has an operating temperature range of -50°C to $+200^{\circ}\text{C}$. Within the polymer matrix, various amounts and sizes of non-alumina abrasive particles are uniformly and spatially distributed. This unique combination of materials effectively traps loose debris, removes embedded contaminants, and lightly polishes the entire probe surface, tip length, and shaft. **Probe Polish™** can be mounted on various substrates, wafers, and abrasion plates used for on-line and off-line probe cleaning. Furthermore, FTIR and XPS elemental detection methods have shown that **Probe Polish™** does not leave any residuals on the probes or bond pads.

The primary **Probe Polish™** cleaning action occurs during repeated z-axis (up and down) motion into the abrasive polymer and the cleaning is most effective when probes are inserted into new locations. For regular on-line cleaning, the contact areas of probes are cleaned after fifteen (15) or less insertions into **Probe Polish™**; however, certain compounds and accumulated quantities of embedded material may require more and frequent cleaning iterations. By design, low vertical forces are needed to penetrate the

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polymer surface and very little probe needle material is removed; thereby, eliminating potential misalignment issues and damage to the probe tip shape.

Probe Polish™ can be used to clean all types of cantilevered probe needle materials (i.e., tungsten, rhenium tungsten, beryllium copper, and palladium–alloy) as well as the more advanced vertical and area array technologies as shown in before and after images below.

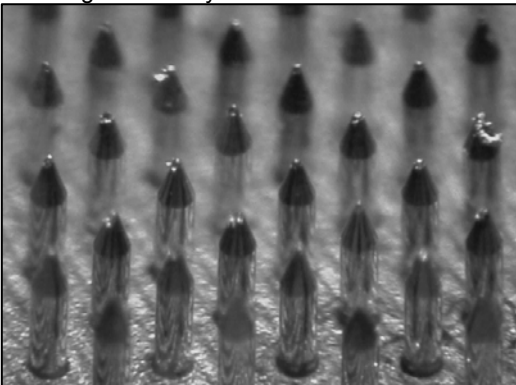


BEFORE – “Dirty” tungsten-rhenium probe tip.

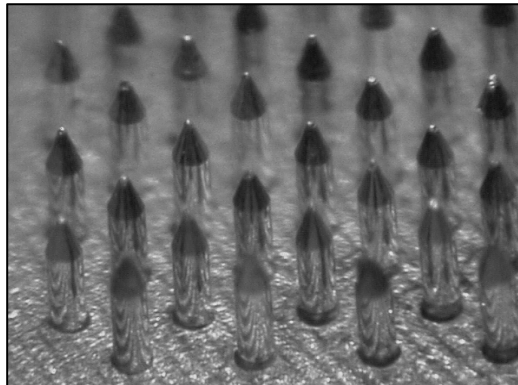


AFTER – 15 insertions into Probe Polish™.

Cobra Images courtesy of Wentworth Labs.



BEFORE –Cobra probes with adherent debris.



AFTER – 5 insertions into Probe Polish™.

Probe Polish™ is specially formulated to encapsulate hazardous heavy metal particulates (such as those generated during lead alloy solder bump probing) and prevent release of these harmful materials into the clean room environment. After the material has been used to clean and collect potentially hazardous materials from the probe, it must be properly disposed in appropriate waste containers according to OSHA recommended practices.

To attain the maximum benefit from **Probe Polish™**, **International Test Solutions** recommends that the material is used regularly starting with new or refurbished probe cards to remove debris. Probe card cleaning frequency varies according to the specific testing environment. In fact, some users have reported cleaning as frequently as every 50 die touchdowns while others clean periodically at 4000 die touchdowns.

Contact **International Test Solutions (ITS)** directly or a local **ITS** distributor with your specific probe card cleaning requirements.

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