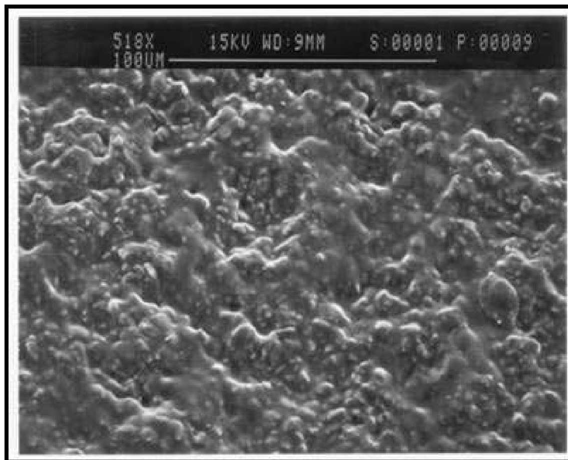
international TEST SOLUTIONS	Probe Lap™	Technical Brief

Reduced Debris Generation During Abrasive Cleaning

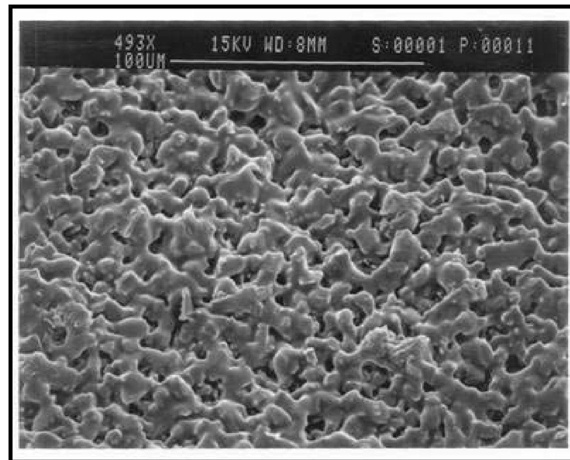
ALL of the lapping films used for on-line probe card cleaning have been adapted from other industries which include polishing and texturing of plastics, metals, magnetic media, oxide coated discs, fiber optics connectors, metallography, and other lapping and grinding applications. On-line abrasive cleaning using aluminum oxide based lapping films (0.5, 1, 3, or 5-μm grit) is probably the oldest and most rudimentary method of controlling contact resistance (C_{RES}) during wafer level test.

The practice is extremely simple – each time a cleaning operation is executed; adherent contaminates as well as small amounts of probe material are physically removed from the probe tip to expose a clean contact surface. Historically, this practice has been empirically determined by the wafer test professional and cleaning recipes can vary widely from company to company. However, as the requirements of the wafer test environments become more demanding, drawbacks of the lapping films, which are minor in other industries, can dramatically affect wafer yield and throughput. Some of these drawbacks are debris generation, abrasive layer and pressure sensitive adhesive (PSA) thickness variations and inconsistencies, and poor temperature characteristics.

Probe Lap™ was developed specifically for cleaning probes during room temperature and "hot chuck" wafer level test applications and is used in the material stack of **Probe Scrub™**. The proprietary coating process used to fabricate **Probe Lap™** results in a material that imparts a proper contact surface finish with significantly reduced debris generation, provides consistent stock removal, and has excellent performance across a wide temperature range (ambient up to 125°C). **Probe Lap™** can be used with all probe needle materials (i.e., tungsten, rhenium tungsten, beryllium copper, and palladium–alloy).



"Pink" – 3 μm grit lapping film
(~500X Mag)



Probe Lap™ – 3 μm grit lapping film
(~500X Mag)

In the figure above, the SEM photomicrographs clearly show surface morphology differences between the "pink" lapping film currently used by most sort floors to abrasively clean probe tips and the advanced design and profile of the **Probe Lap™**

For fine-pitch applications, **Probe Lap™** with a nominal 1 μm abrasive particle size was developed. Some users have found that multiple cleanings with the "yellow-green" material results in a very smooth finish that "skitters" across the bond pad without penetrating through the surface oxide layer. As with the 3 μm film, the abrasive layer has a different structure the "yellow-green" material and the surface morphology facilitates consistent material removal without excessive polishing of the contact surface.

Probe Scrub™, ***Probe Clean™***, *and* ***Probe Polish™*** *are registered trademarks of International Test Solutions.*

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CASE STUDY – For an automotive device, wafer sort required an elevated temperature of 125°C. After each abrasive cleaning operation, the user found unstable C_{RES} performance and often read electrical "opens". When examined under a microscope, the probe tips were covered with very tenacious contamination. The hot probes had penetrated through the abrasive layer of the "yellow-green" lapping film and scrubbed into the polyester film. On-line cleaning was then performed with **Probe Lap™**. As shown in the figure, the probes did not penetrate the **Probe Lap™** and provided consistent cleaning.

"Yellow-green" – 1 µm grit lapping film after probe cleaning operation at 125 ^{O}C.

Probe Lap™ – 1 µm grit lapping film after probe cleaning operation at 125 ^{O}C.

Accumulation of abrasive particles, binder, polyester film and other probing debris on the probe tip after cleaning with 1 µm grit lapping film.

Significantly reduced accumulation of debris on the probe tip after cleaning with 1 µm grit **Probe Lap™**.

Probe Lap™ can be mounted on the various substrates, wafers, and abrasion plates used for on-line and off-line probe cleaning. In many instances, **Probe Lap™** can be used as a direct replacement for current lapping film applications. Advanced and fine pitch probe card technologies cannot withstand severe frictional shear loading or surface deformation against any sort abrasive pad. As such, for most wafer level test applications, **International Test Solutions (ITS)** recommends a non-destructive, low impact cleaning technique such as **Probe Clean™** or **Probe Polish™** to collects debris, clean the contact surface, and maintain the tip shape.

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

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