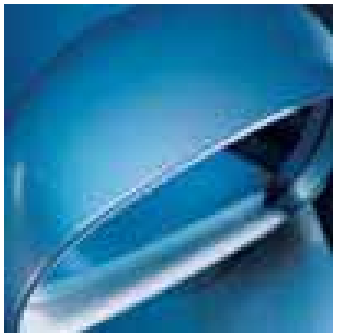
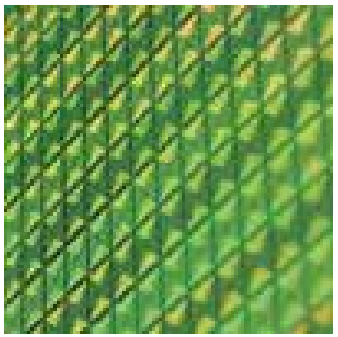




Atmospheric Plasma

Applications in Electronic Packaging

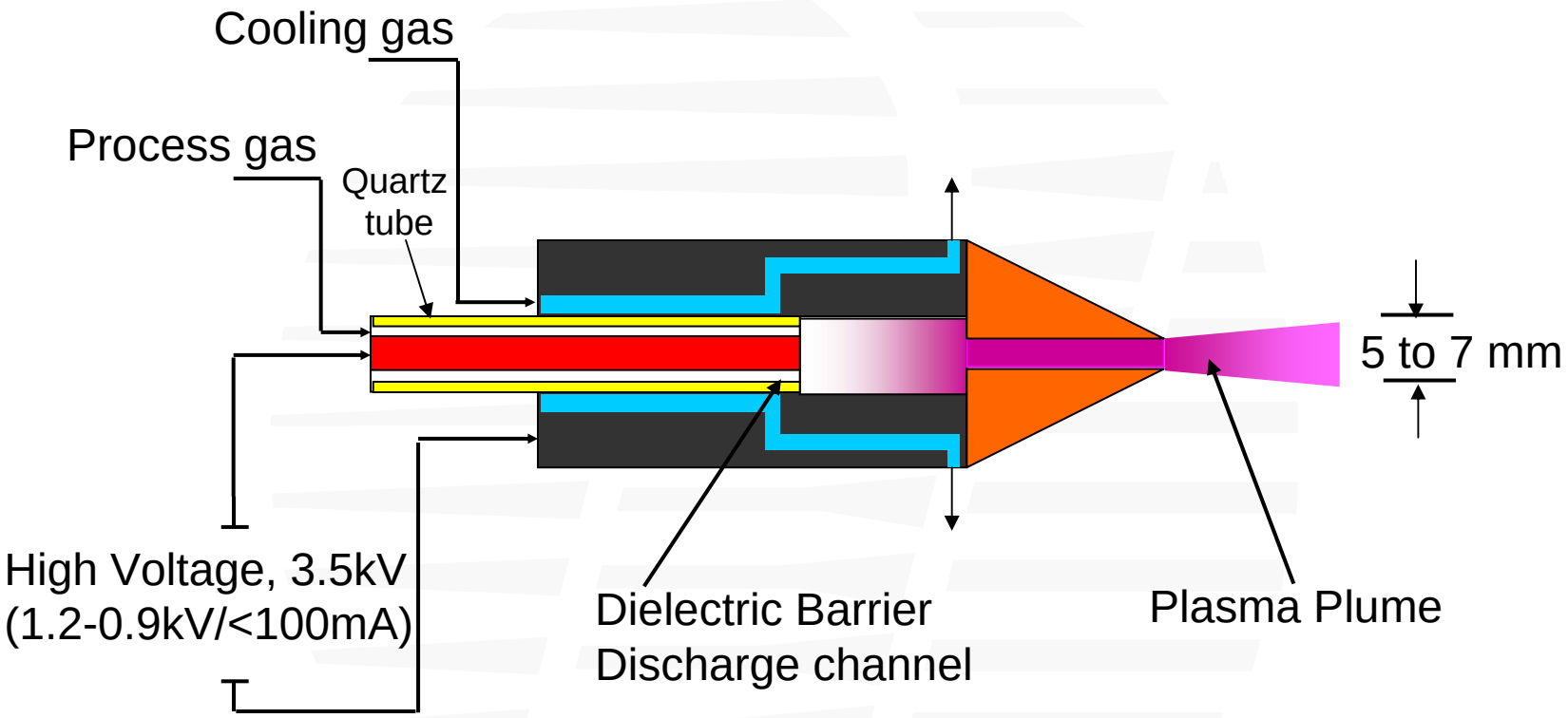
Basic Function of PlasmaPen™

Surface treatment tool

The PlasmaPen™ is an atmospheric gas plasma system used to clean and modify the surface properties of a material.

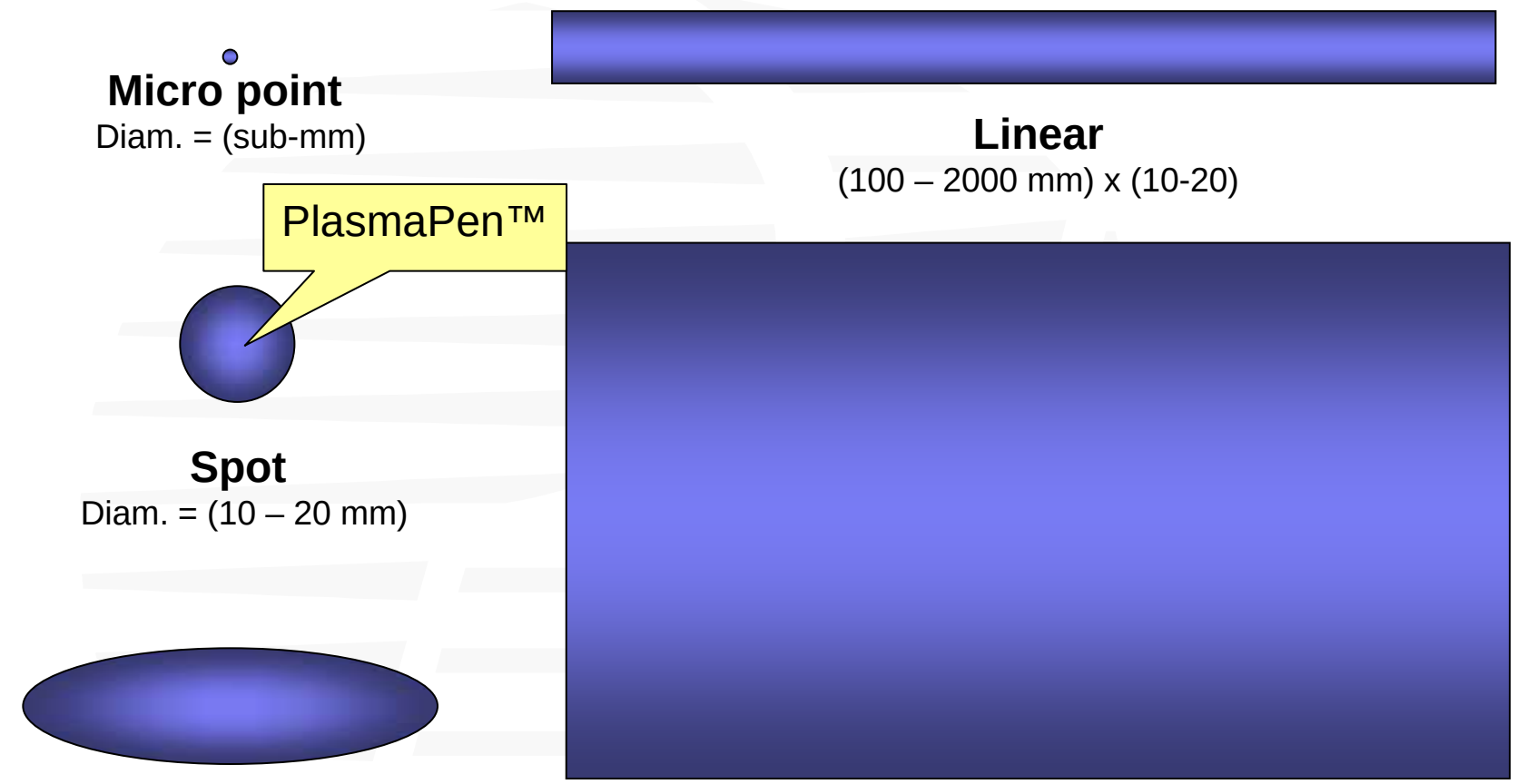
The PlasmaPen™ is ideally suited for *in situ* precision cleaning and activation of materials during manufacturing assembly and packaging.

PlasmaPen™ schematic



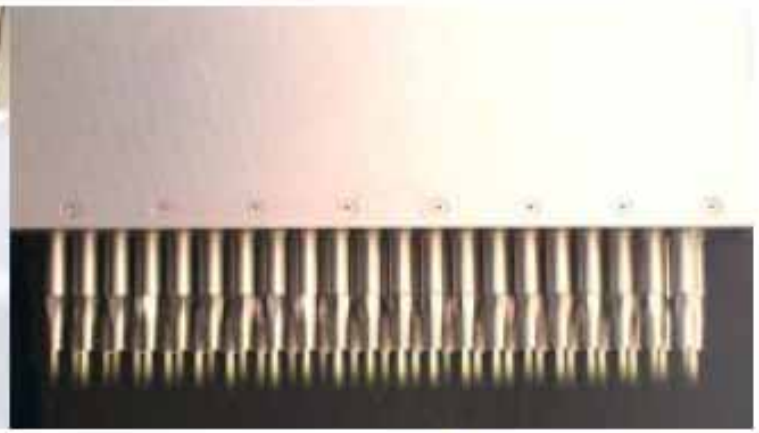
Treatment are regimes

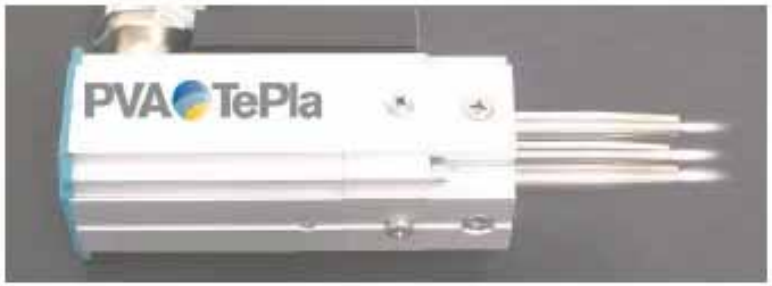
PlasmaPen™ technology *niche*

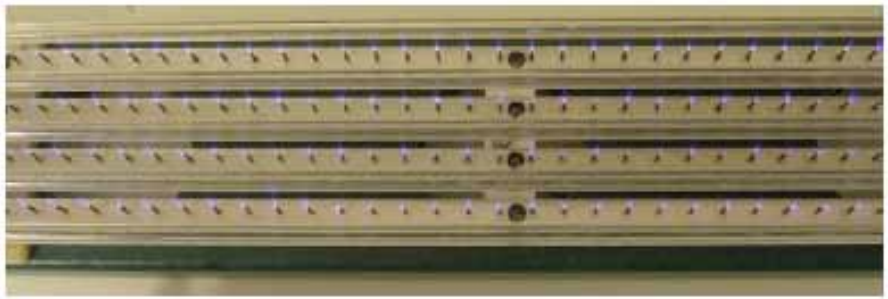


Treatment are regimes

PlasmaPen™ technology *niche*







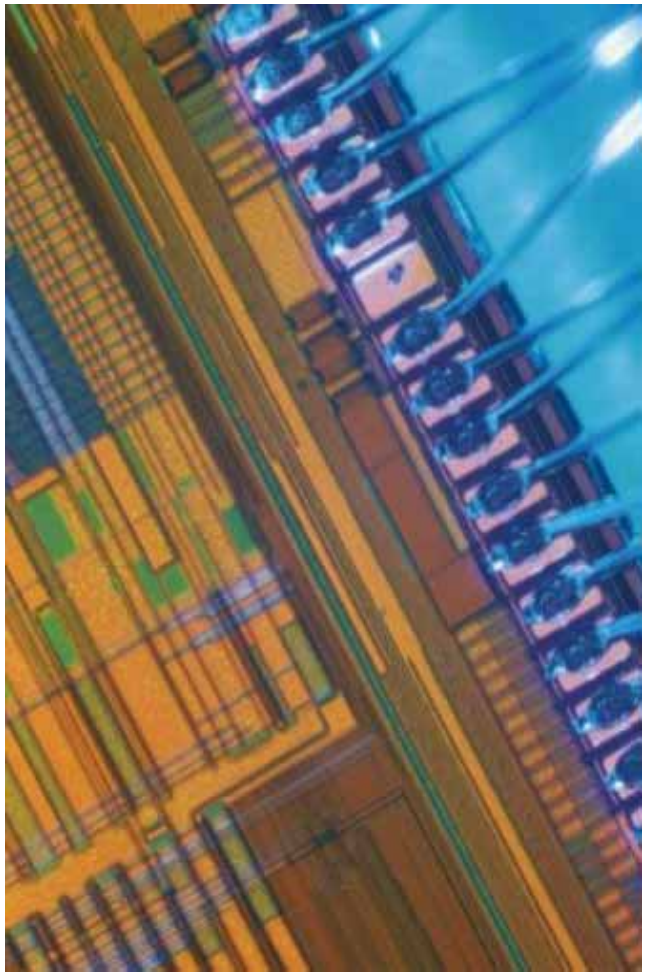
Control Features and Options

Hardware - RoboPen

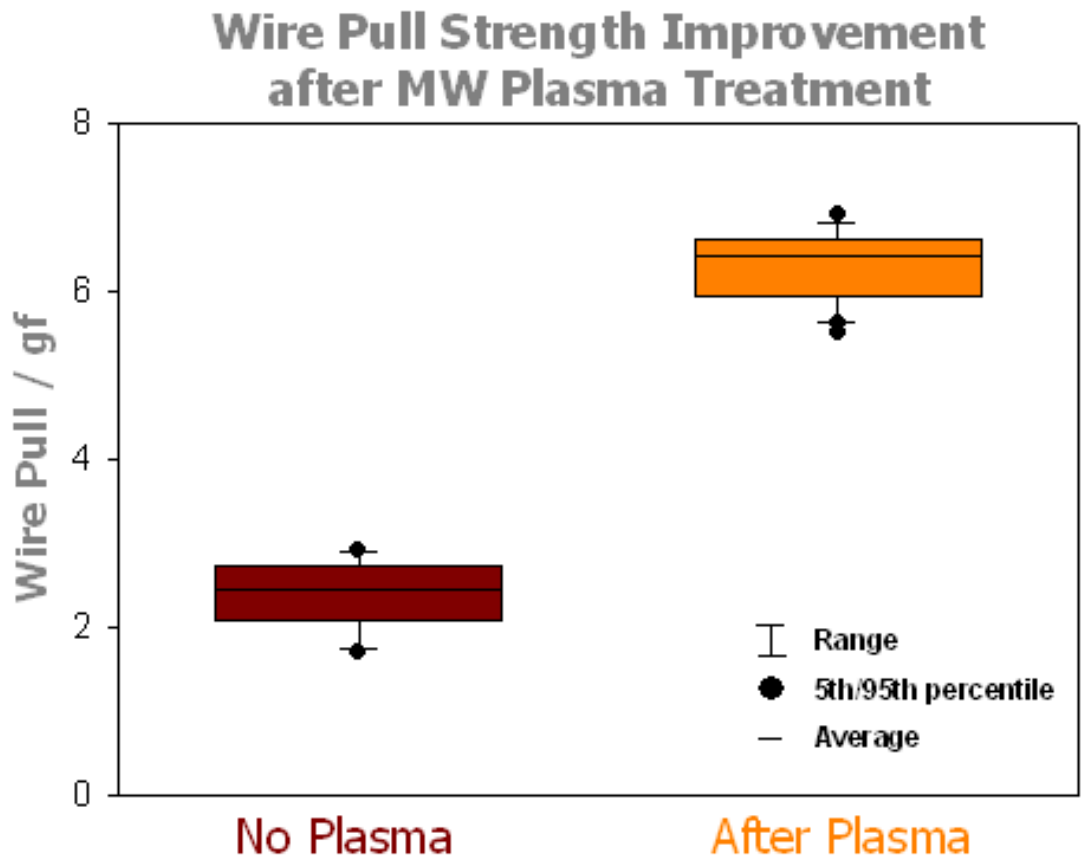
Applications

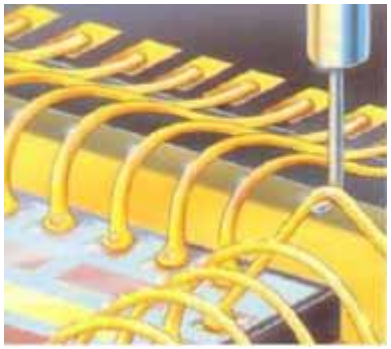
Plasma Pre-Wirebonding

- Maximizes bond strengths
- Minimizes non-sticks
- Minimizes bonding power for delicate dies

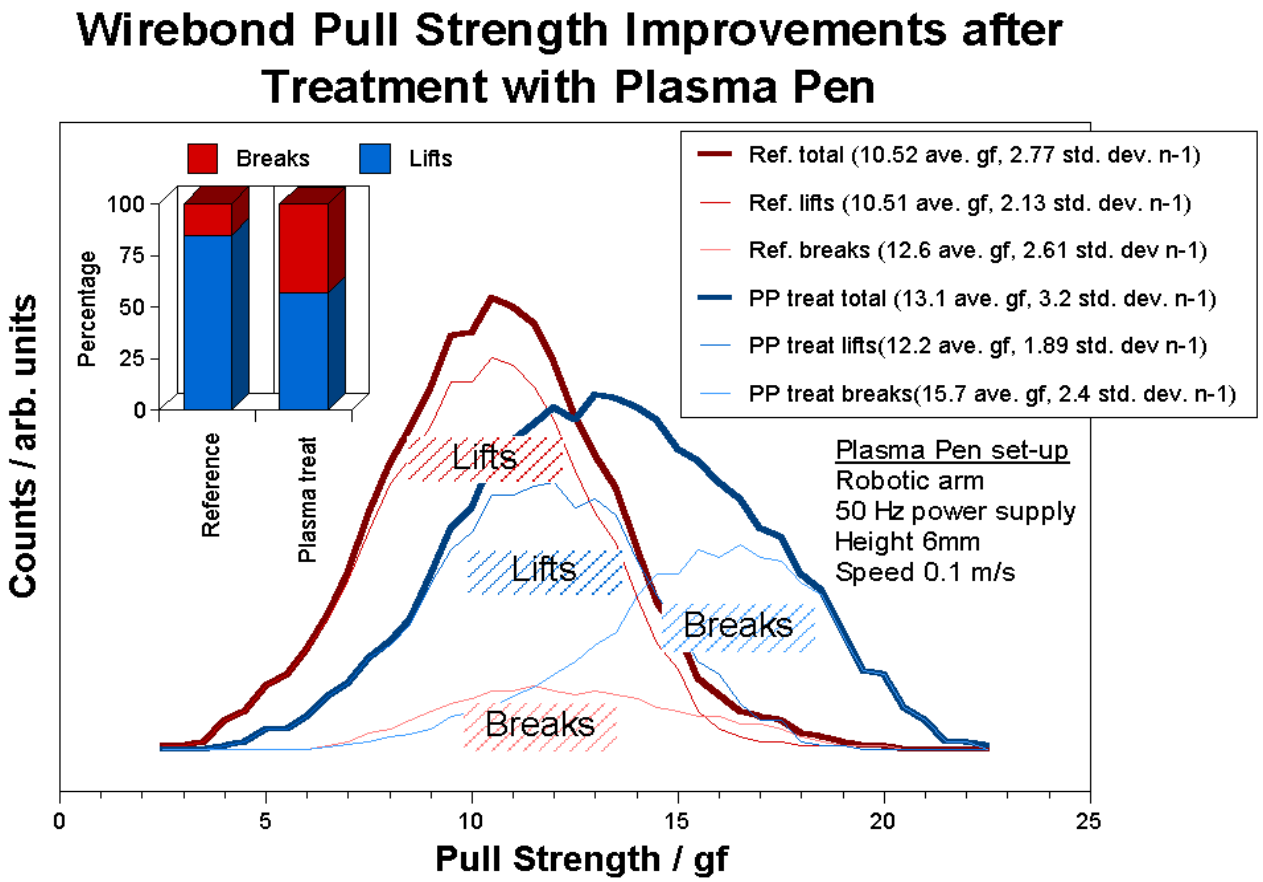


Plasma pre-wirebonding - Wire Pull strengths





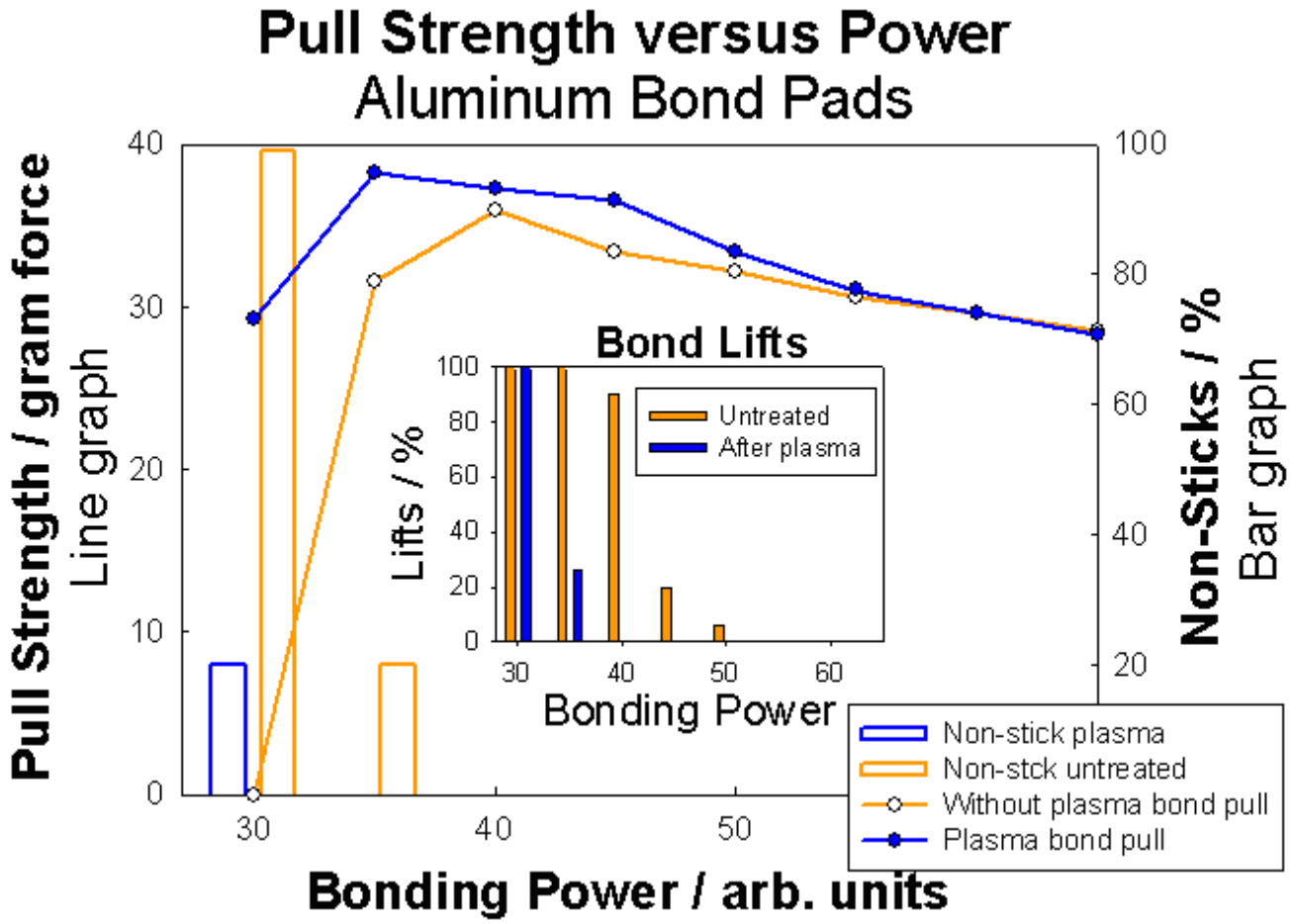
Applications
Treatment prior to wirebonding



Wire bond pull strength distributions are shown for before and after plasma treatment. Component distributions for lead lifts and heel breaks are also shown under each main curve. The insert shows a graphic for the increased percentage wire break after plasma treatment

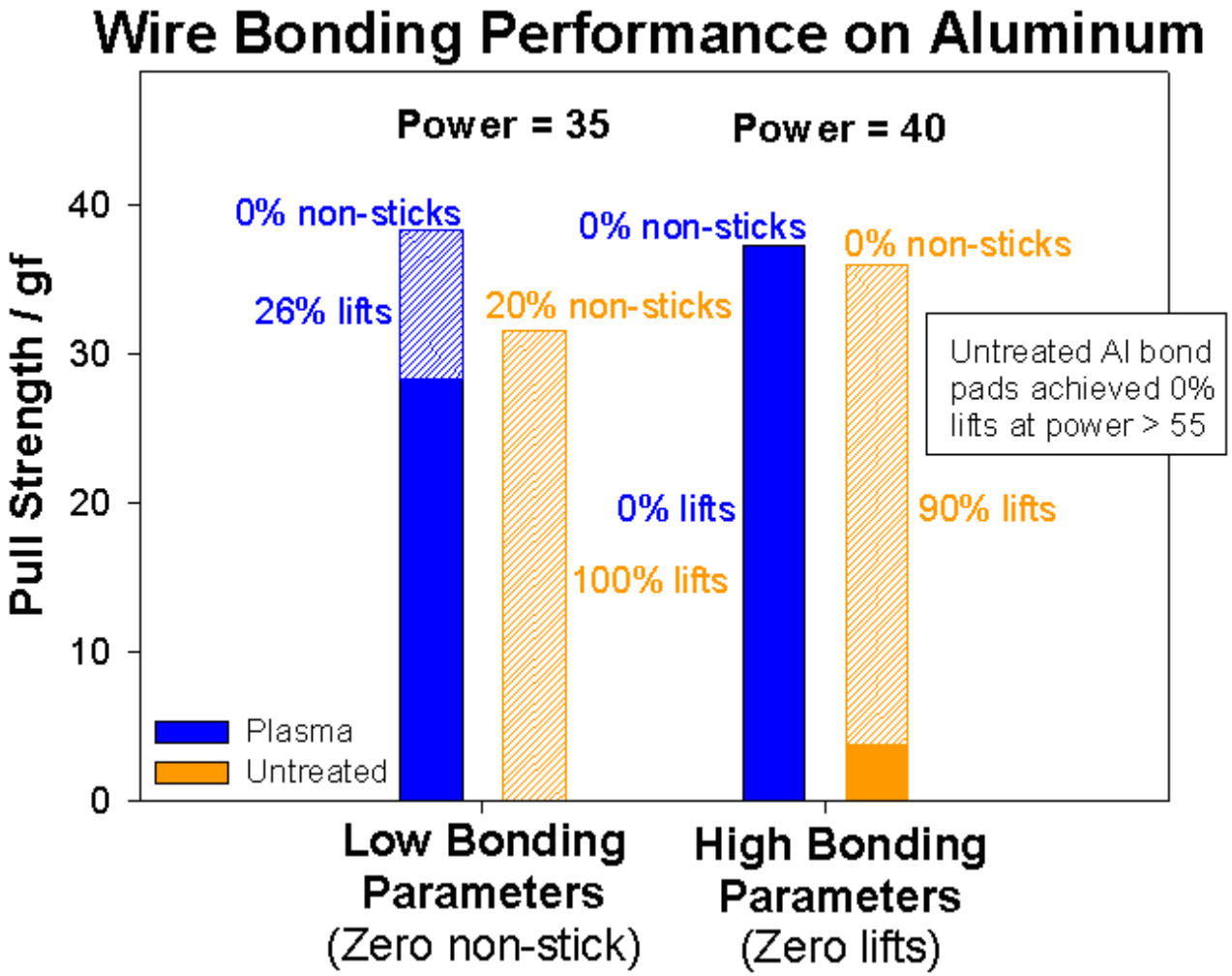
Applications

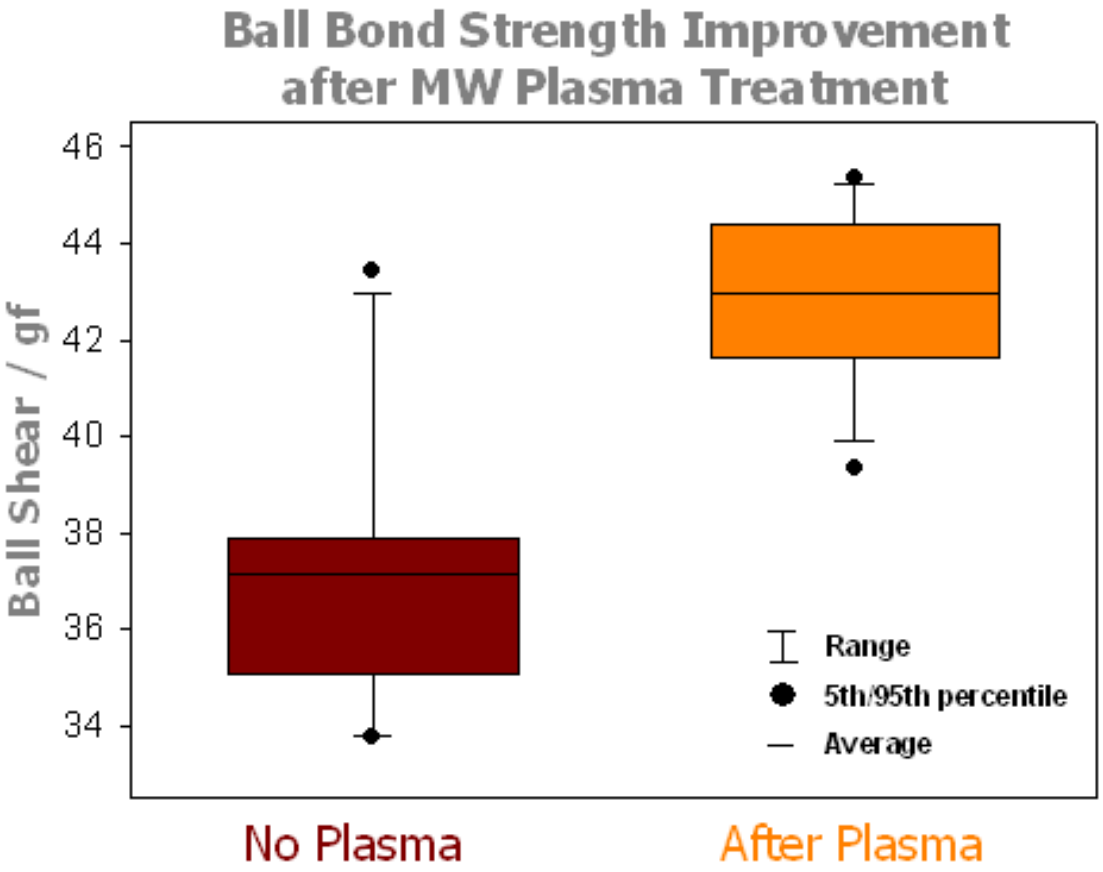
Treatment prior to thin die wirebonding

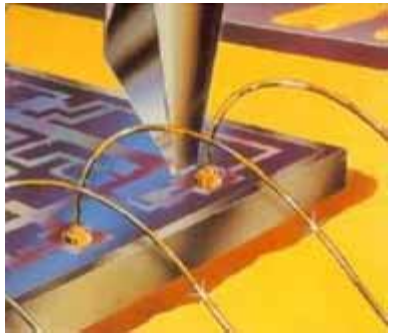


Applications

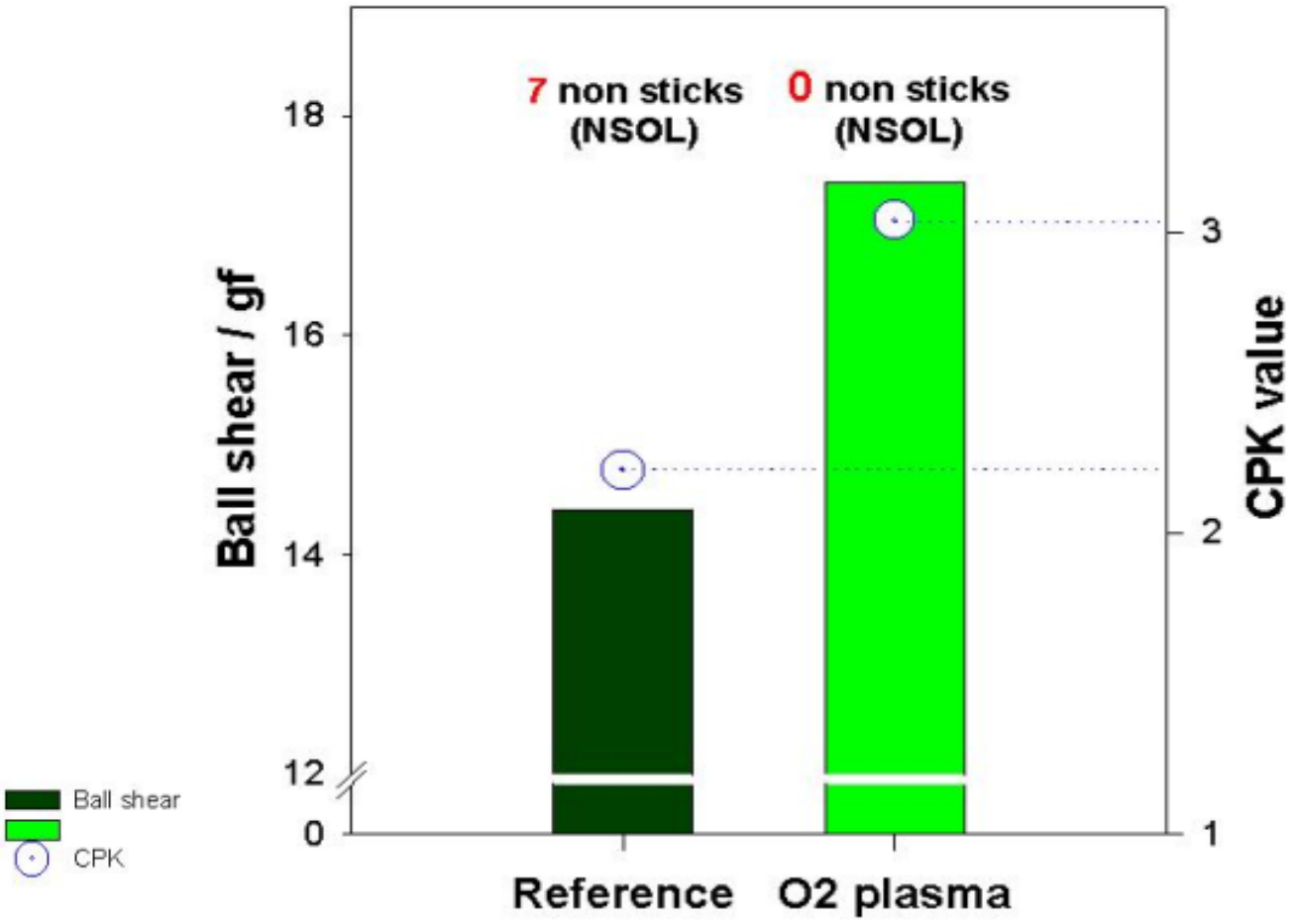
Treatment prior to thin die wirebonding

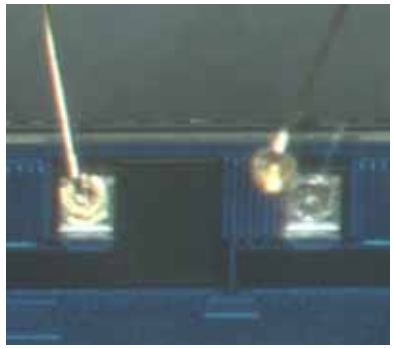



Ball Bond Strength Improvement
after MW Plasma Treatment
Ball Shear / gf
46
44
42
40
38
36
34
Range
5th/95th percentile
Average
No Plasma
After Plasma



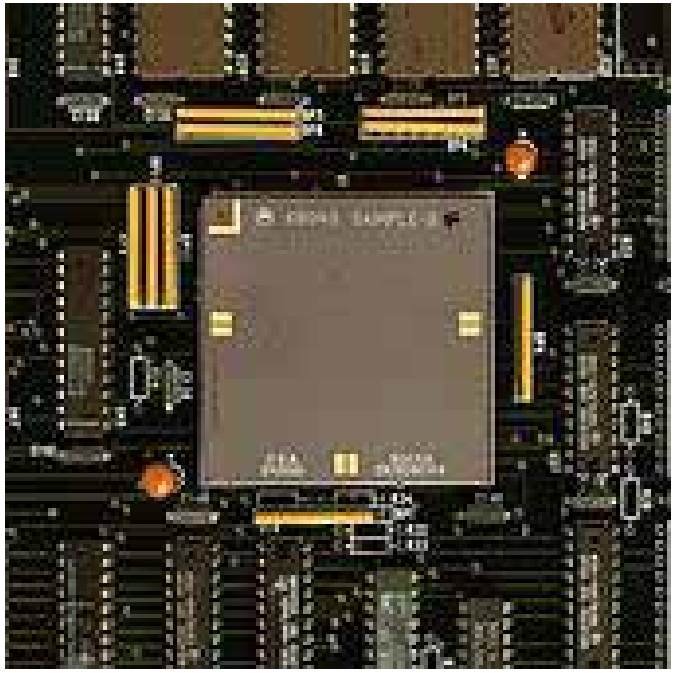
Elimination of non-stick after MW plasma

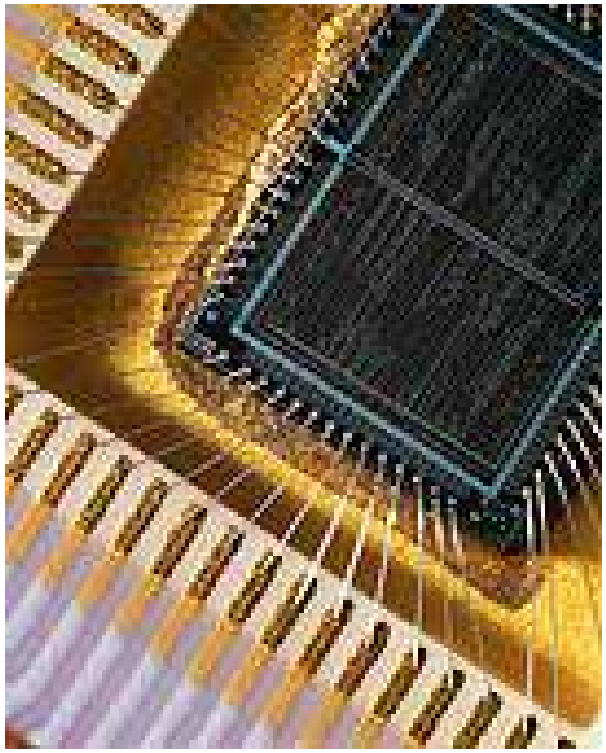




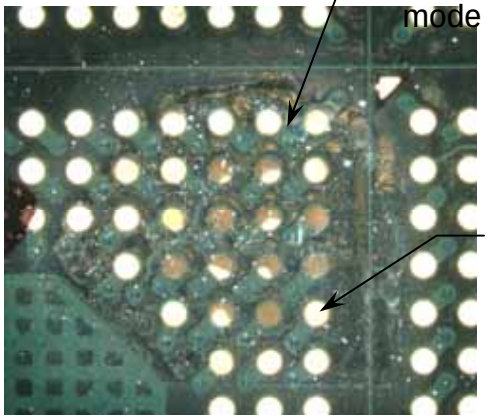
PBGA
GigaBatch 690

Applications
Die attach





Applications
Die attach

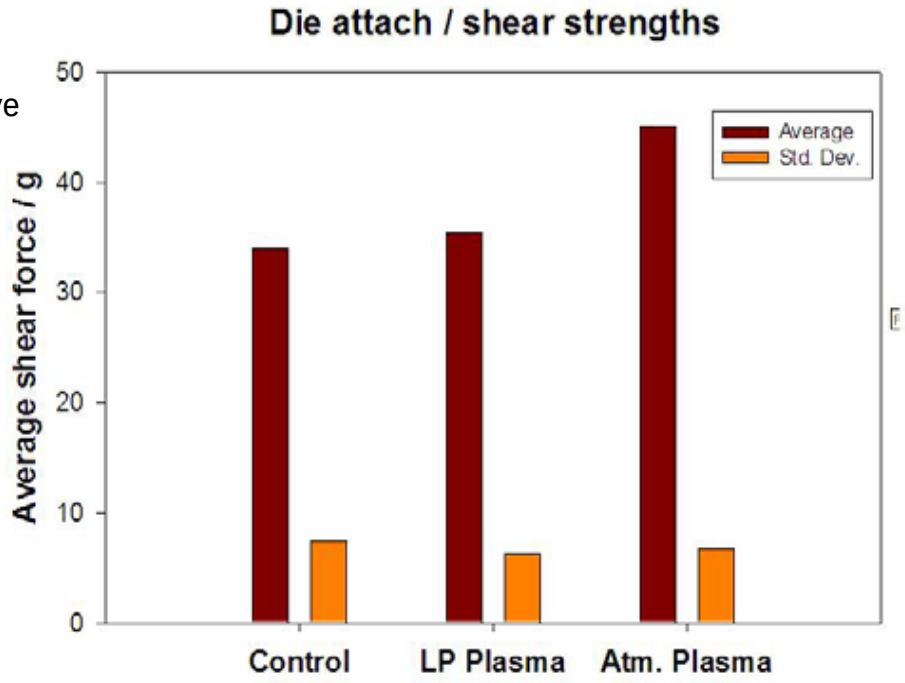


Post shear

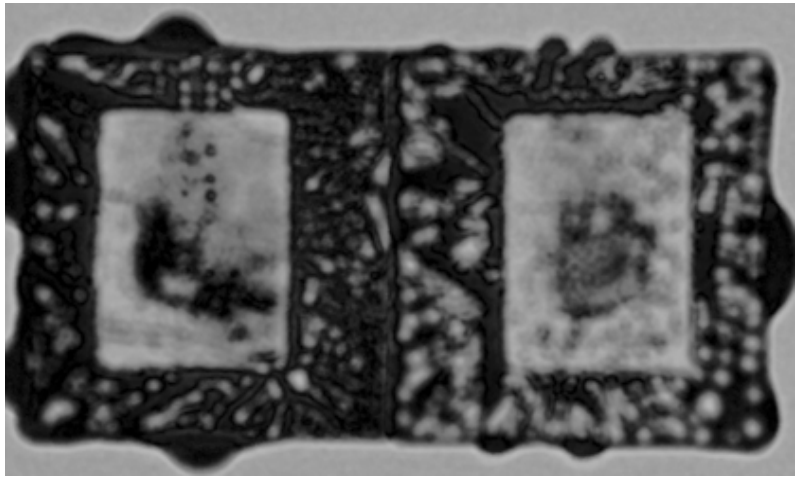
Namics U844314 cured at 150º C for 1 hr.

Taiyo solder mask

Dage die shear system

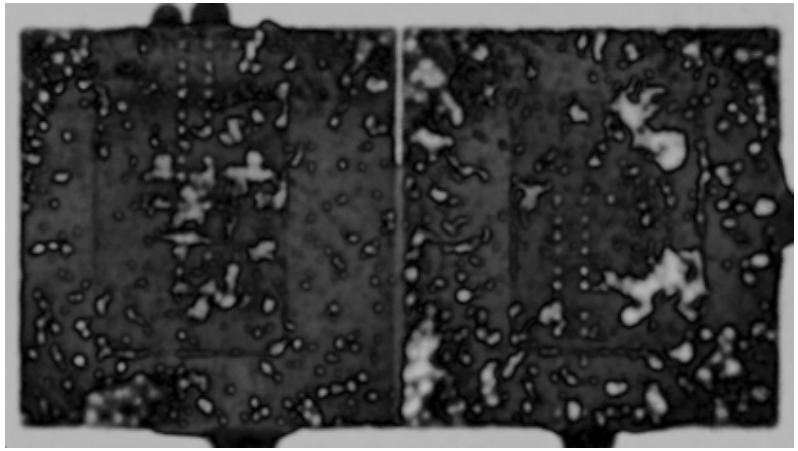


Applications
Die attach



K. 1x1 Kovar coupon substrate without PlasmaPen™

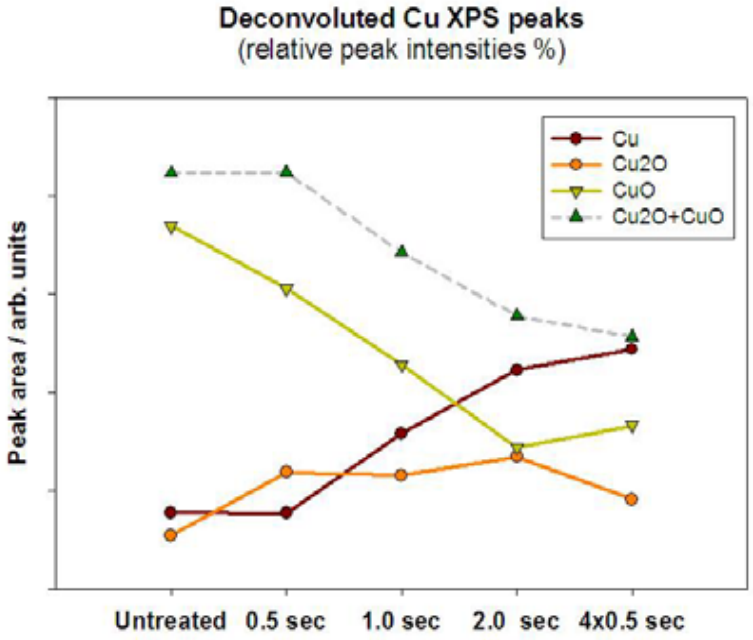
Die size, 193x185x4

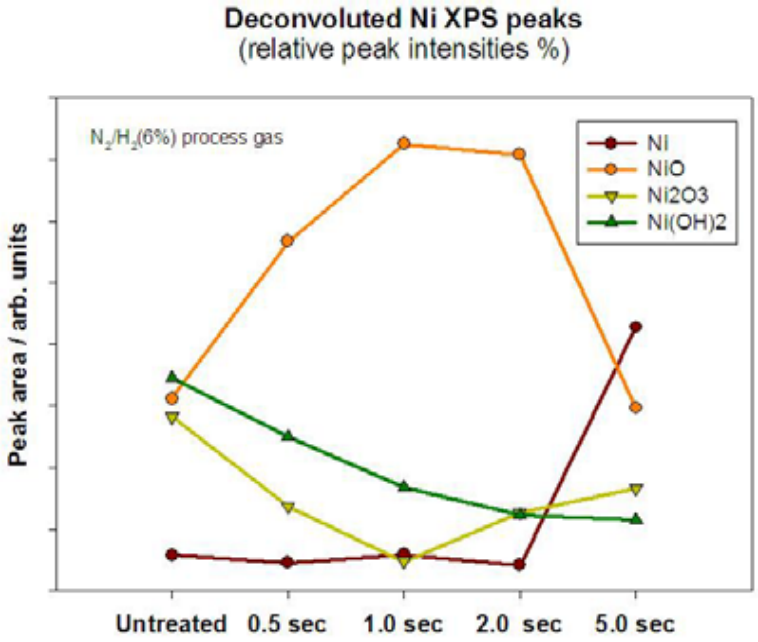


C1. 1x1 Kovar coupon substrate with PlasmaPen™

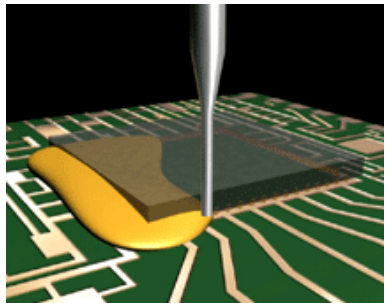
Applications

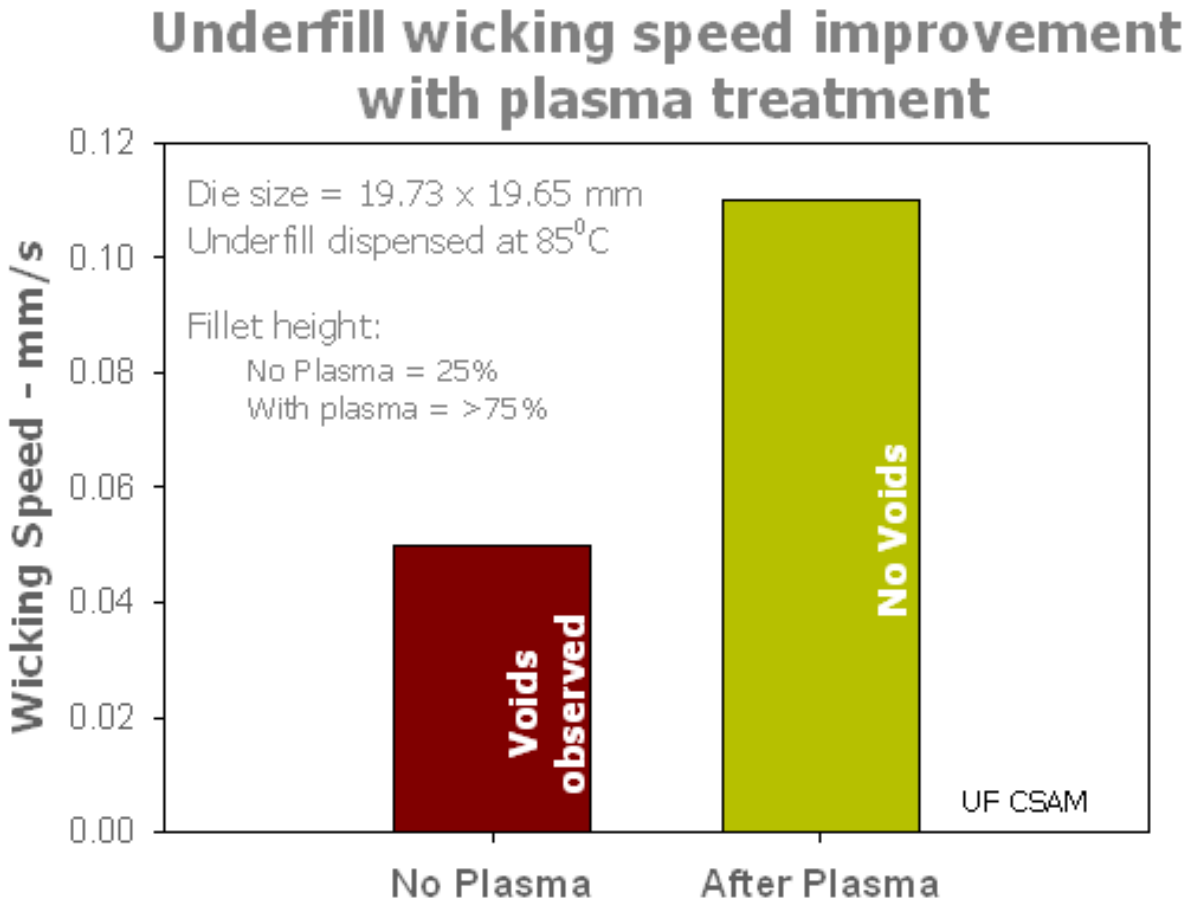
Reduction of oxides on copper and nickel





Plasma pre-underfill

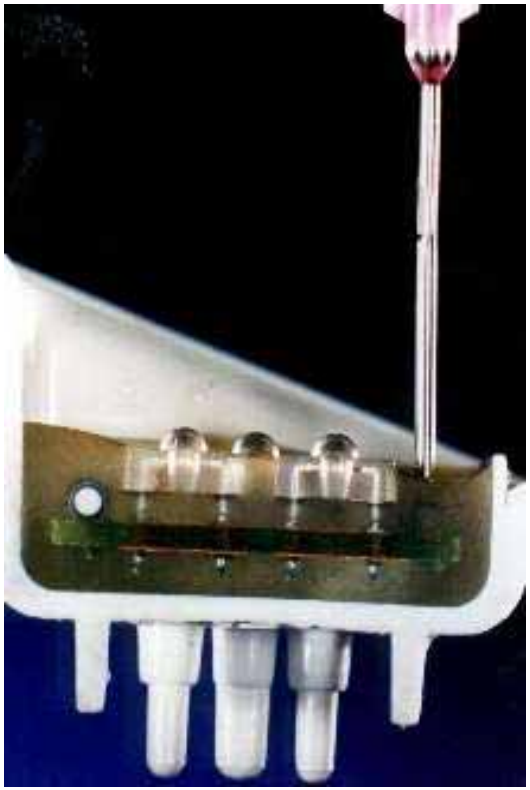




Typical PlasmaPen™ Process Applications
Potting / Encapsulation / Conformal Coatings

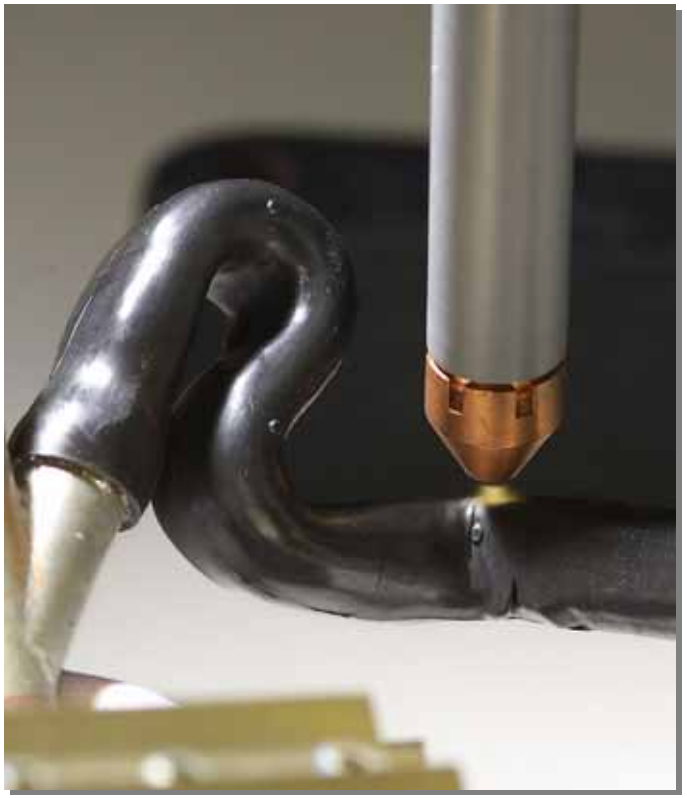
How does plasma improve potting?

Plasma treatment increases wettablility of polymers to potting compounds by chemically adding polar functional groups to the surface. The result is no skips, voids, blisters, or bleeding caused by incomplete wetting of the encapsulant.
For other materials, (glass, ceramics, metals *etc*) a more wettable surface results primarily because oily surface residues are removed by the plasma.

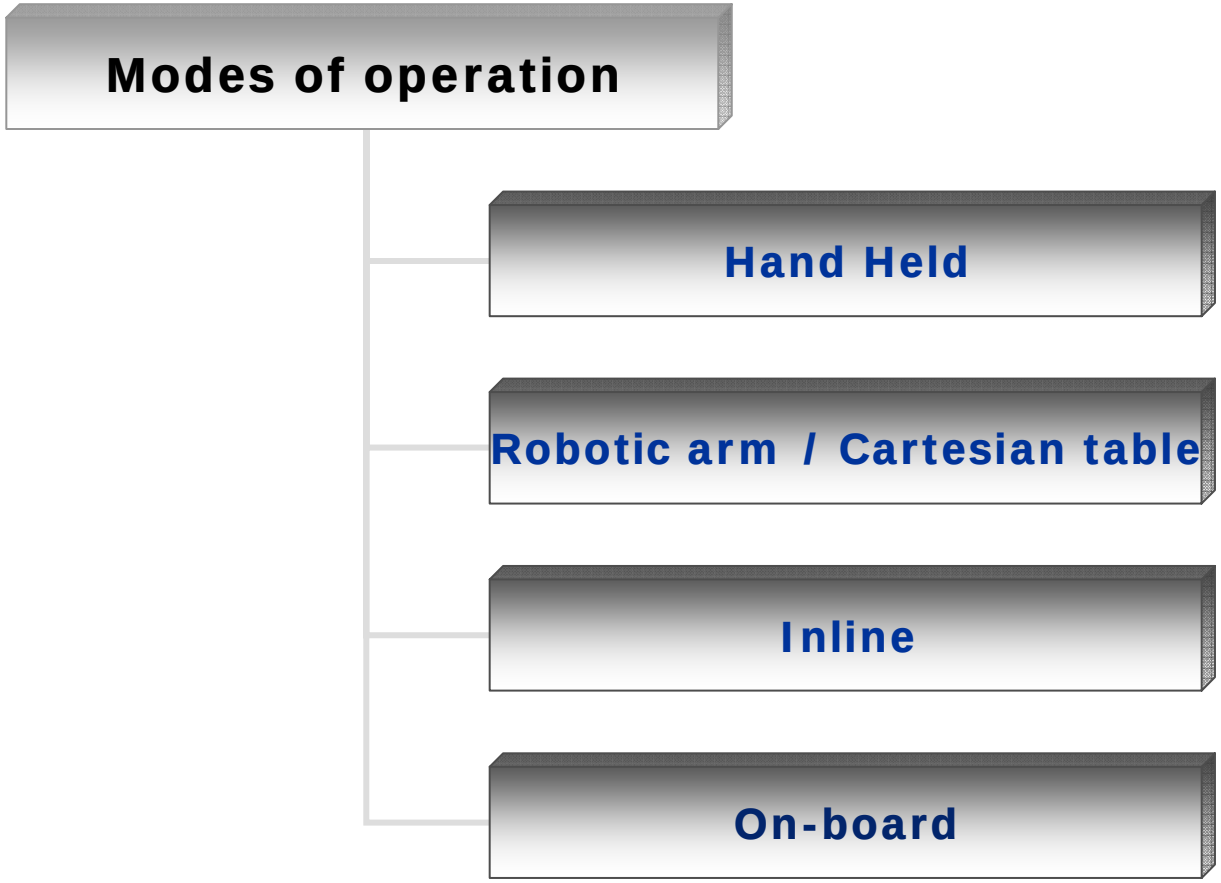


Aircraft cable repair

Aircraft and other heavy cable insulation can be repaired *in situ* using the PlasmaPen™ .
The damage can be overmolded or encapsulated successfully by the adhesion promotion properties of the plasma.



PlasmaPen™ modes of operation



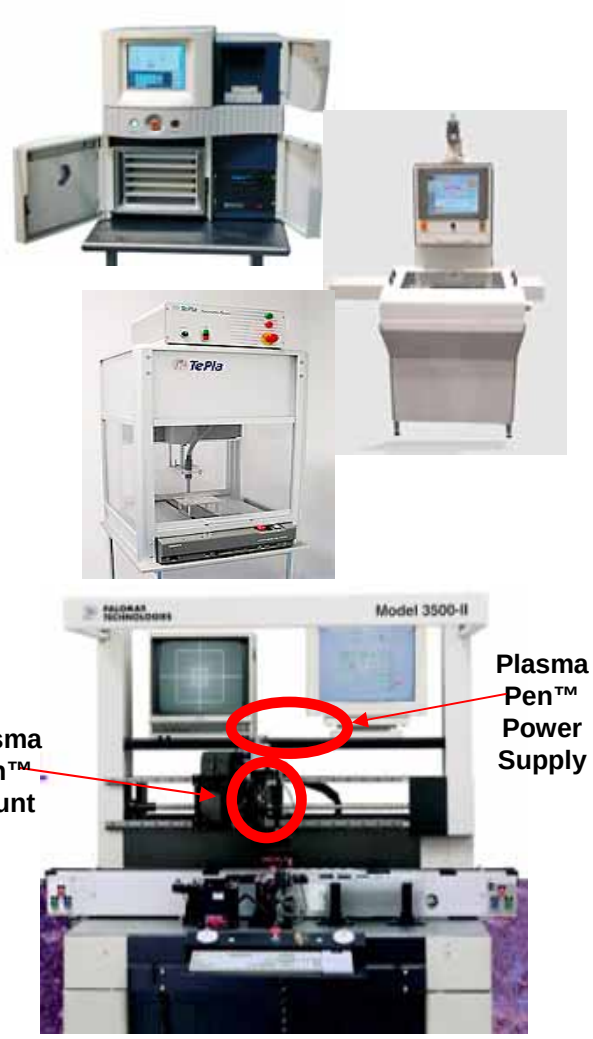
Evolution of plasma surface treatment in manufacturing

Low pressure batch processing

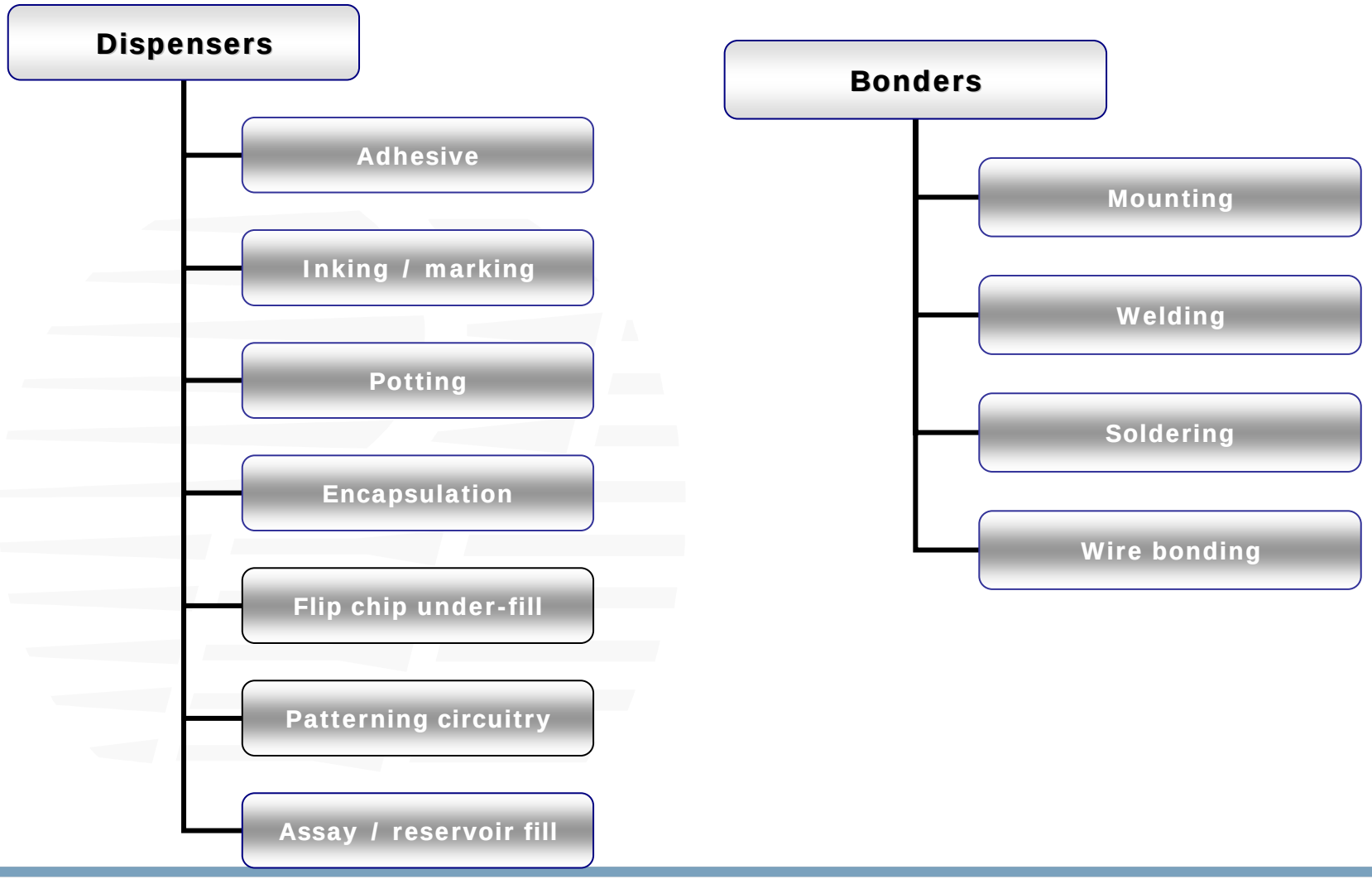
Low pressure in-line processing

Atmospheric in-line processing

Atmospheric in-situ / on-board processing



Market Applications
High potential for OEM partnerships



Advantages of in-situ treatment

- Easy integration either in-line or on-board
- No substrate staging means faster production flow
- Plasma applied locally
- Subsequent processes performed immediately after treatment
- No voltage or current in plasma plume means no damage to electronic devices
- Low operating costs – compressed air
- Low capitol cost compared to vacuum plasma

PlasmaPen™ Overview

Reactant gas: Compressed air (6 Bar, (88 psi), 1000 liters/hour (15 f^3/h))
Other gases: N_2, N_2/H_2, O_2, CO_2, He

Treatment width: 8-10 mm at 10 mm distance

No voltage or current in plasma plume

Lifetime of the electrode tip: >1500 hours

Standard umbilical length: 9 feet

Electricity: 115 VAC, 1 phase, 60 Hz or 230 VAC, 1 phase, 50 Hz

CE Certified

Standards and Compliances

- NFPA79, NFPA70

- CE
- Directives:
- 2006/95/EC, Low Voltage Directive
- Standard IEC EN 61010
- 2004/108/EC Electromagnetic Compatibility
- Standard IEC EN 61326
- CISPR 55011

- ISO
- ISO9001: 2000

Thank you for listening