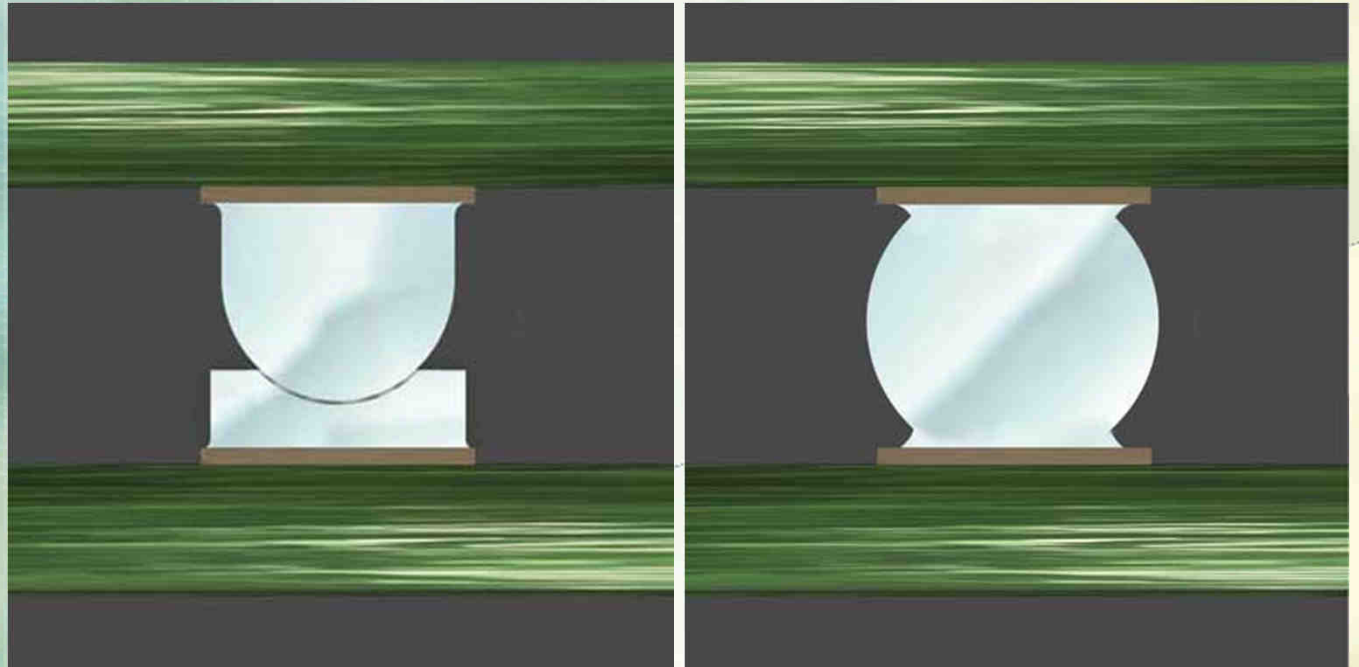




Solder Sphere Head-In-Pillow

Causes & Solutions

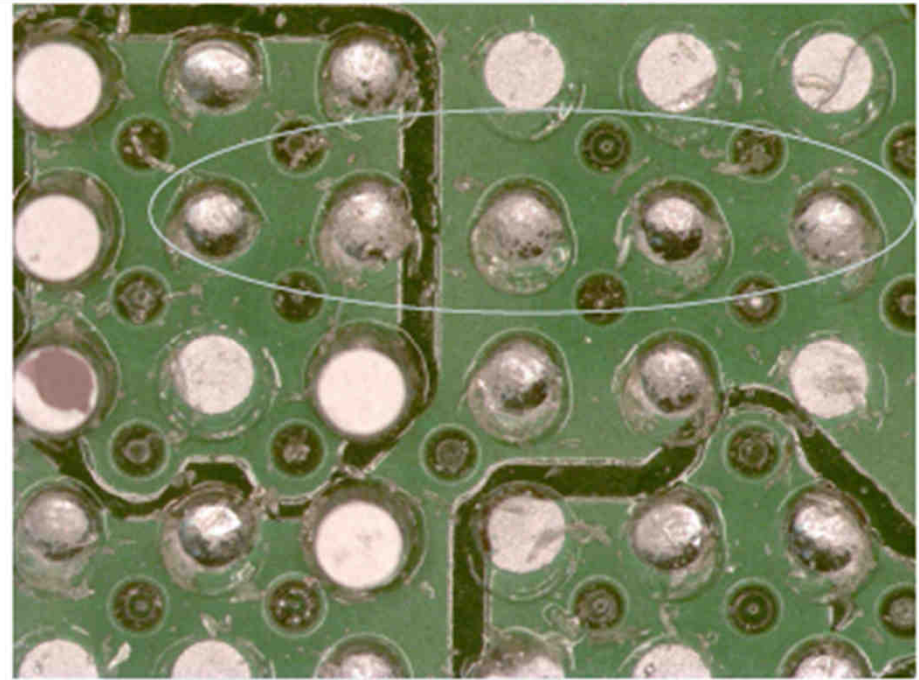
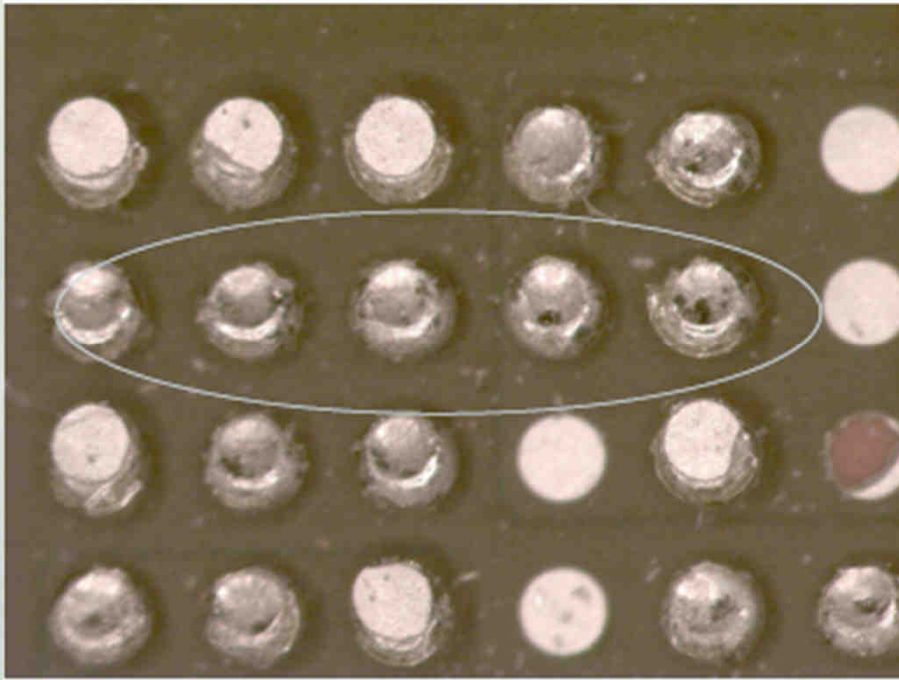
Mario Scalzo CSMTPE, 6 σ Black Belt
Sr. Tech Support Engineer
mscalzo@indium.com

Agenda

- Overview
- Issues
 - Supplier
 - Process
 - Material
- Solutions
 - Supplier
 - Process
 - Material
- Steps forward
 - Current solutions
 - Case study
 - Technology roadmap

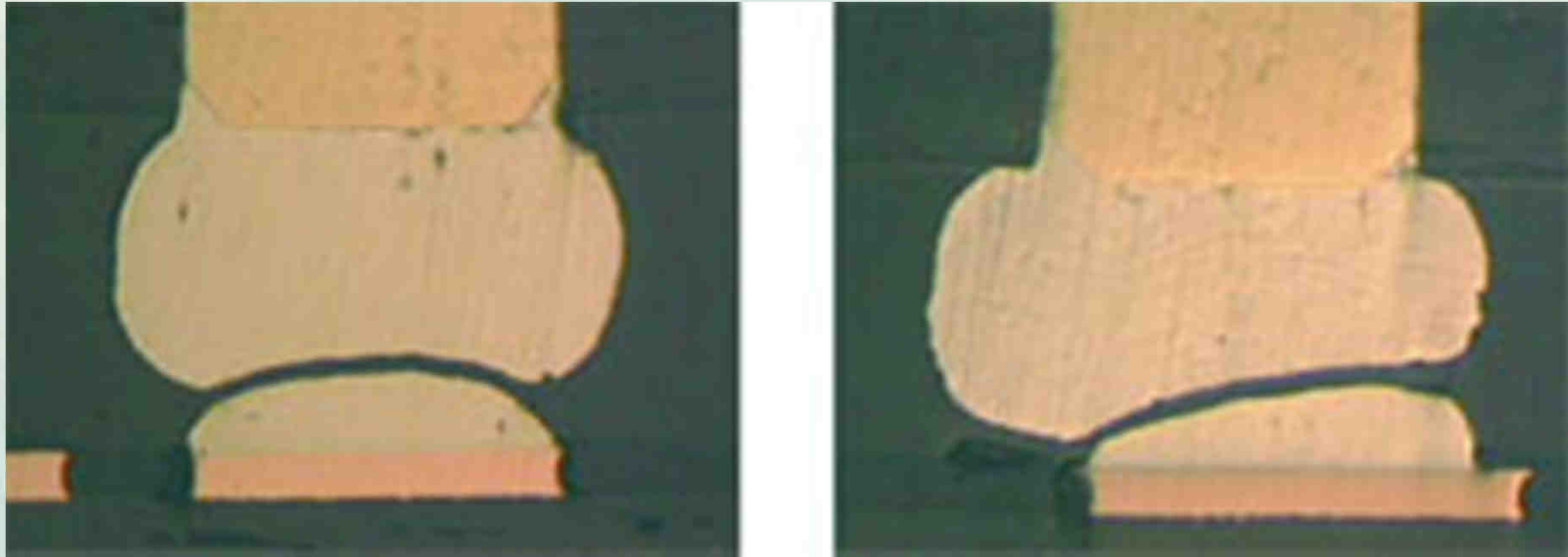
Overview

- Why is it an issue?
 - Still passes ICT & function testing
 - Cause of field failures



Overview

- Type A – Poor Wetting
(Random)

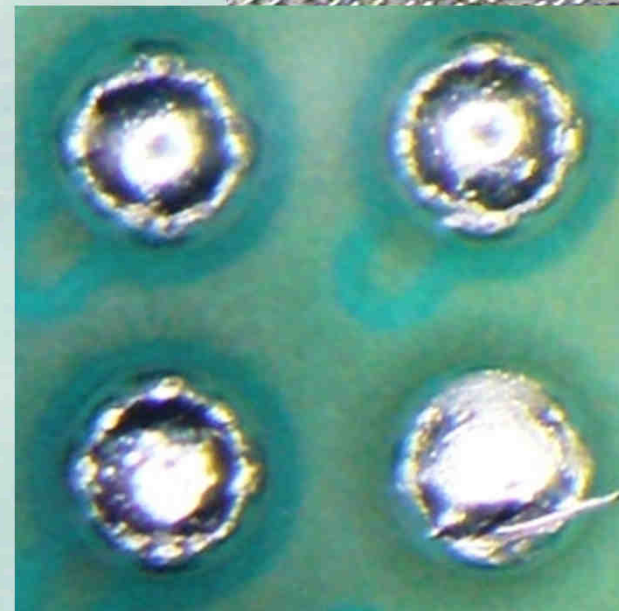
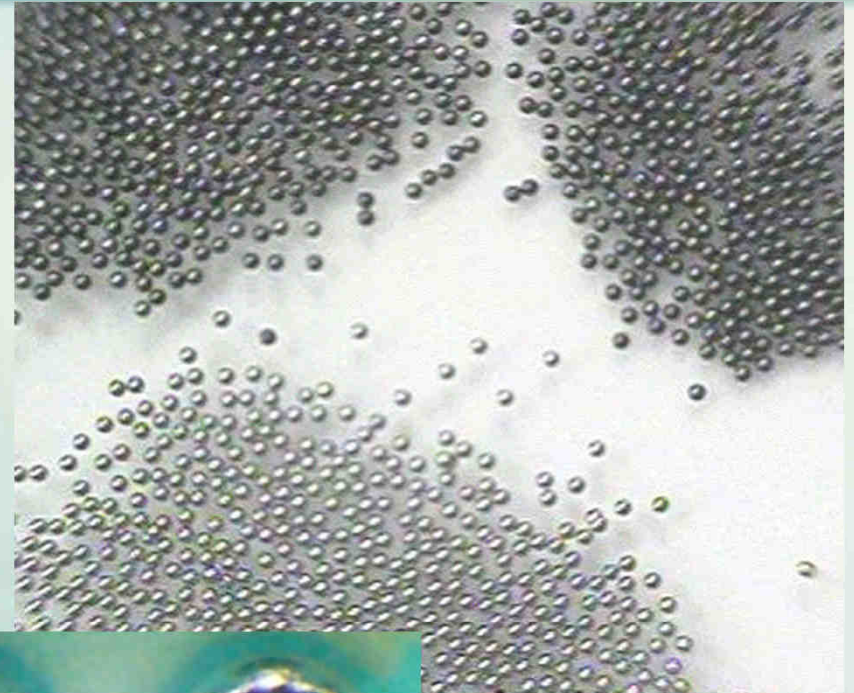


Source: Nikkei Electronics Asia (August 2006)

- Type B – Warpage
(Edge or center effect)

Supplier Issues

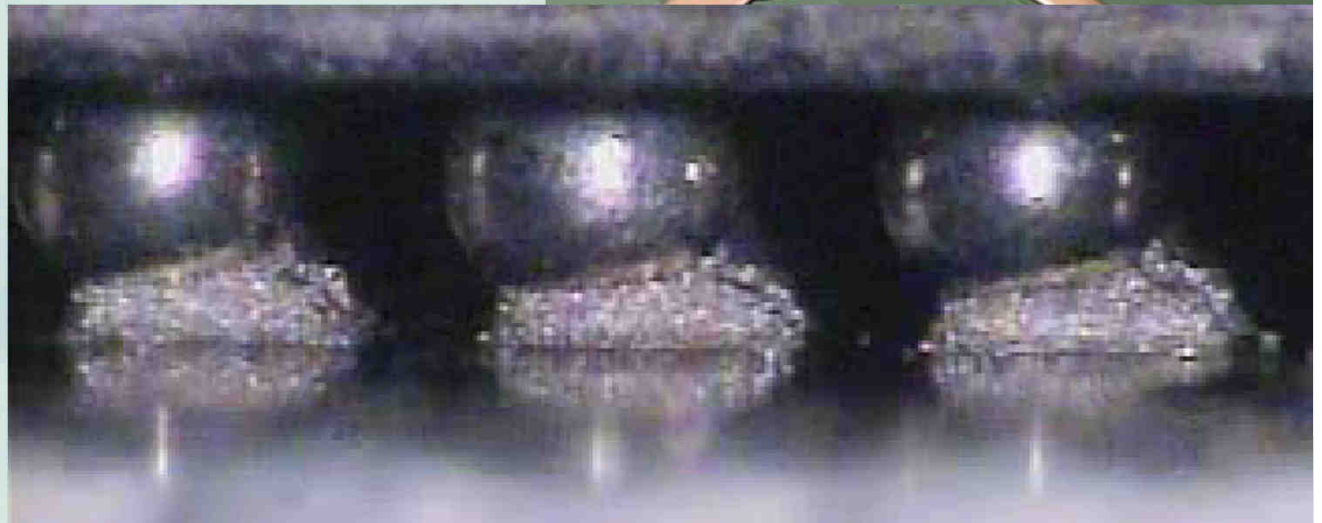
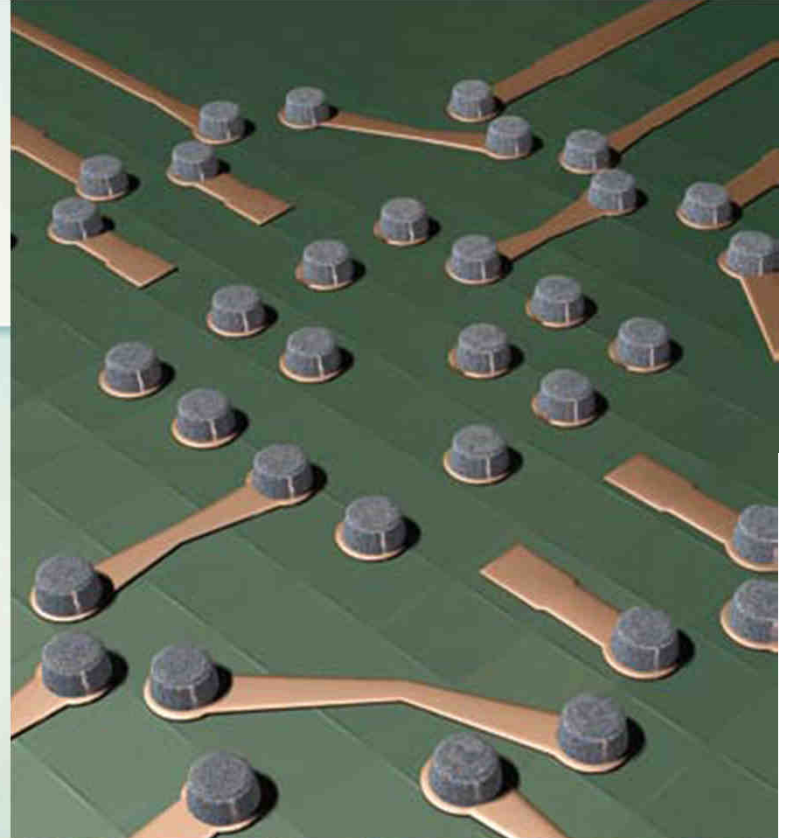
- Sphere Oxidation
 - Uncontrolled manufacturing
 - Packaging
 - Storage
- Silver Segregation
 - Cases seen as high as 36% silver content at the surface.
 - Silver tailing



- Beyond Indium's control

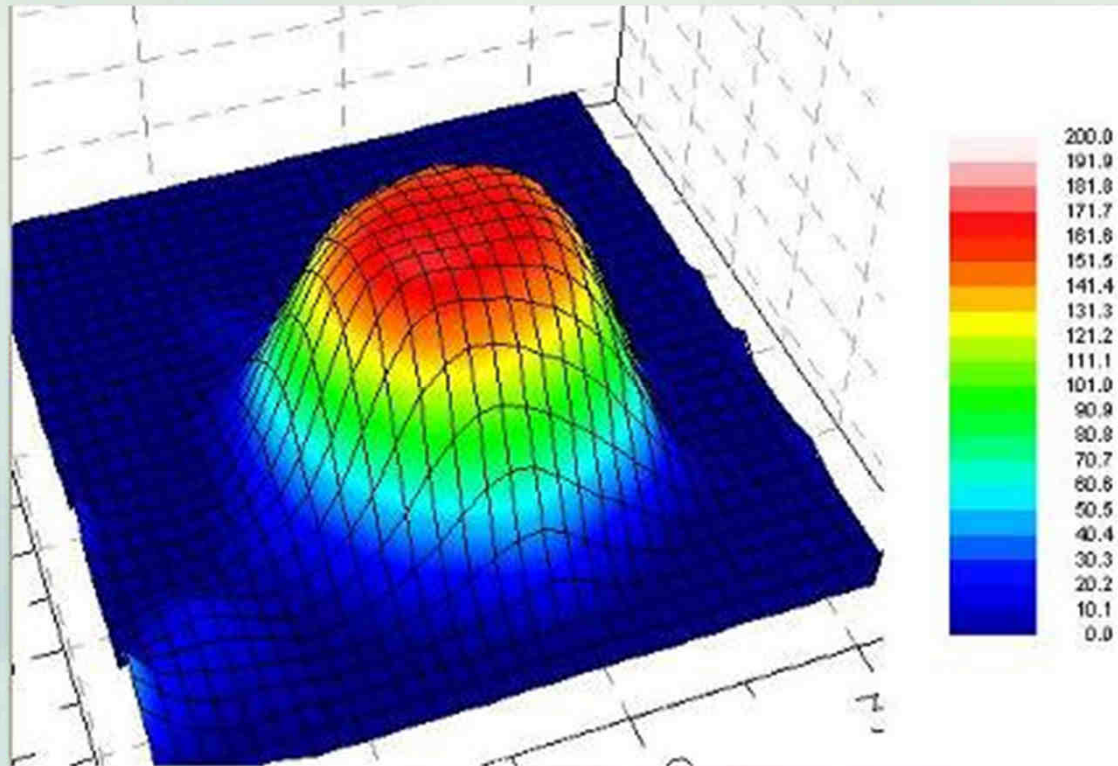
Process Issues...

- Printing
 - Registration accuracy
 - Improper printer setup
 - Stencil Design
- Placement
 - Off pad
 - Out of plane
 - Pressure
- Reflow
 - Warpage
 - Flux exhaustion



Material Issues

- Poor transfer efficiency
- Insufficient oxidation barrier
- Low stability

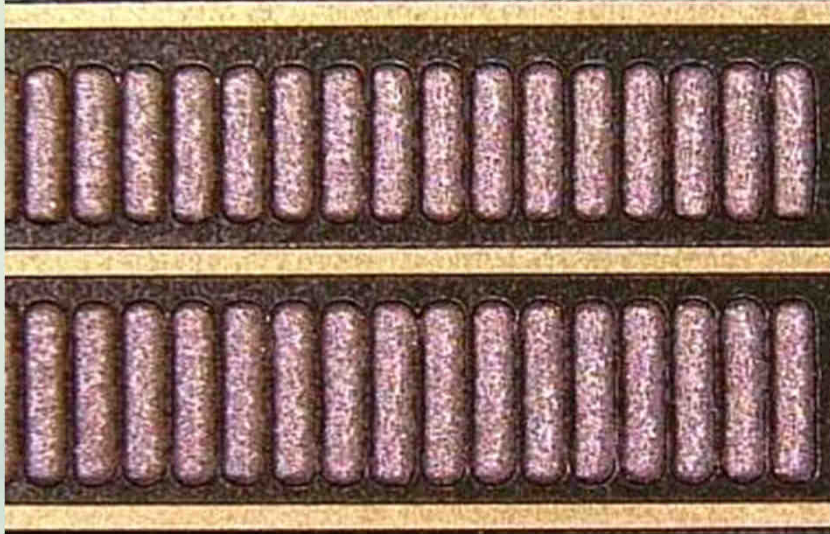


Process Solutions

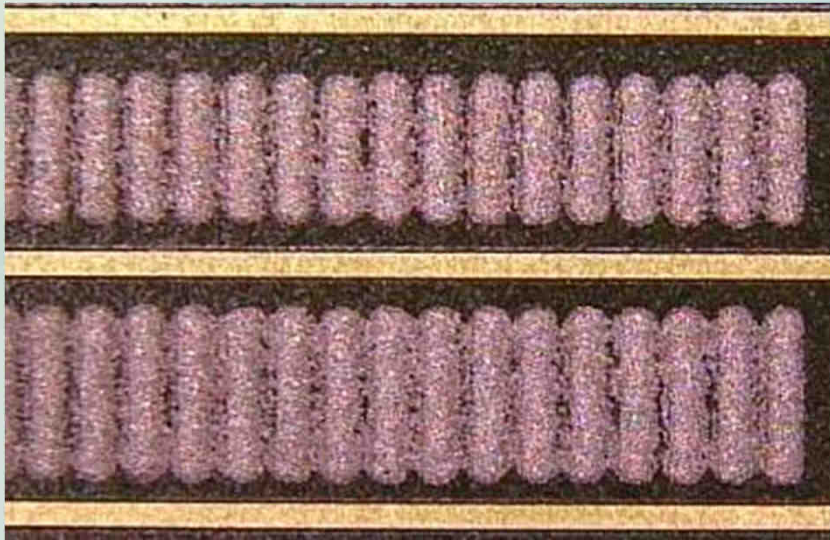
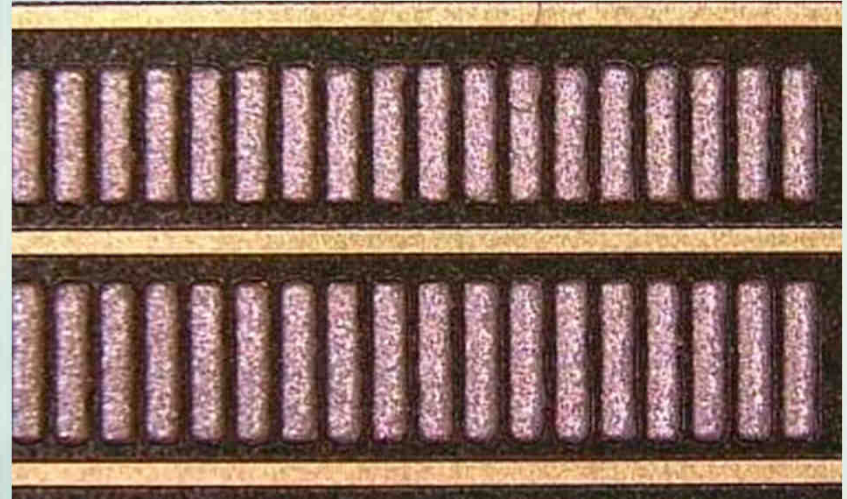
- Printing optimization
 - Print measurement & data tracking
 - Calibration / upgrade
- Placement
 - Local fiducials (pad)
 - Establish process controls
 - Calibration / upgrade
- Reflow
 - Aware of component temperature restraints
 - Avoid excessive heat exposure (time & temperature)
 - Adequate time above liquidus (TAL)
- On site Indium technical support

Testing...

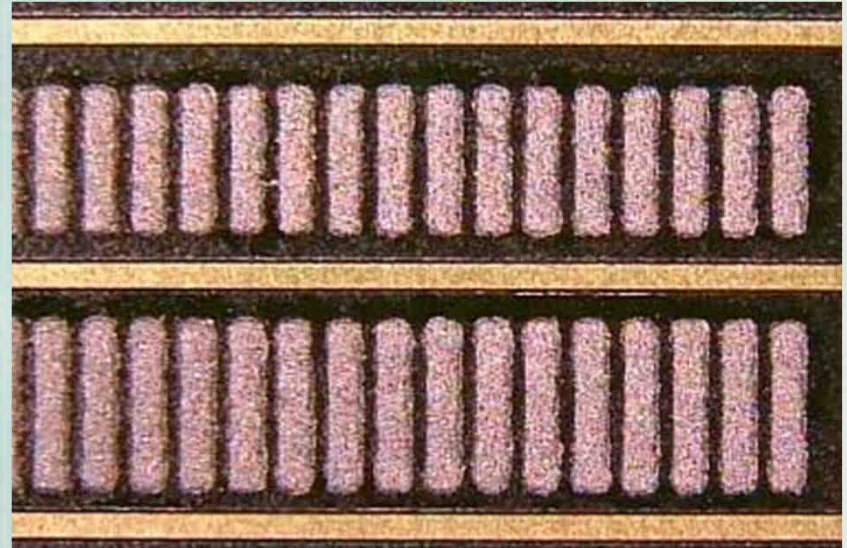
- Slump Resistance



Fresh



**Hot Slump
180°C**



Undesired Reflow Phenomena

Oxidation Resistance Testing

- 90s Time above liquidus (TAL)
- 25°C above liquidus
- Sn/Pb and SAC alloy
- SAC sphere



Poor Oxidation Barrier



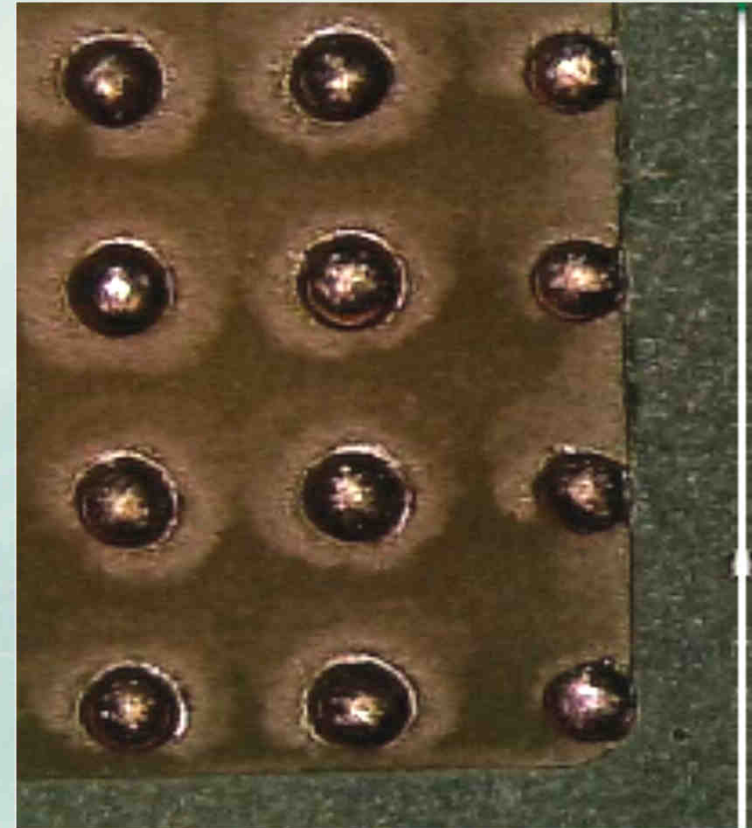
Good Oxidation Barrier

Undesired Reflow Phenomena

Graping



Poor Oxidation Barrier



Good Oxidation
Barrier

Material Solutions

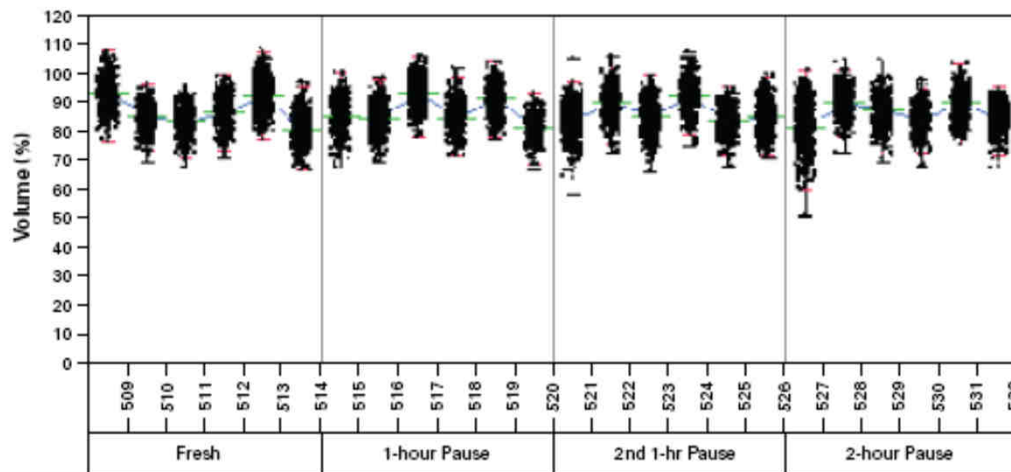
- Dipping process (flux or paste)
 - Flux
 - Increases activity
 - Extra oxidation barrier
 - Paste
 - Type 5
 - Metal load
 - Flux rheology
- Flux or paste can also be used for rework.



Material Solutions

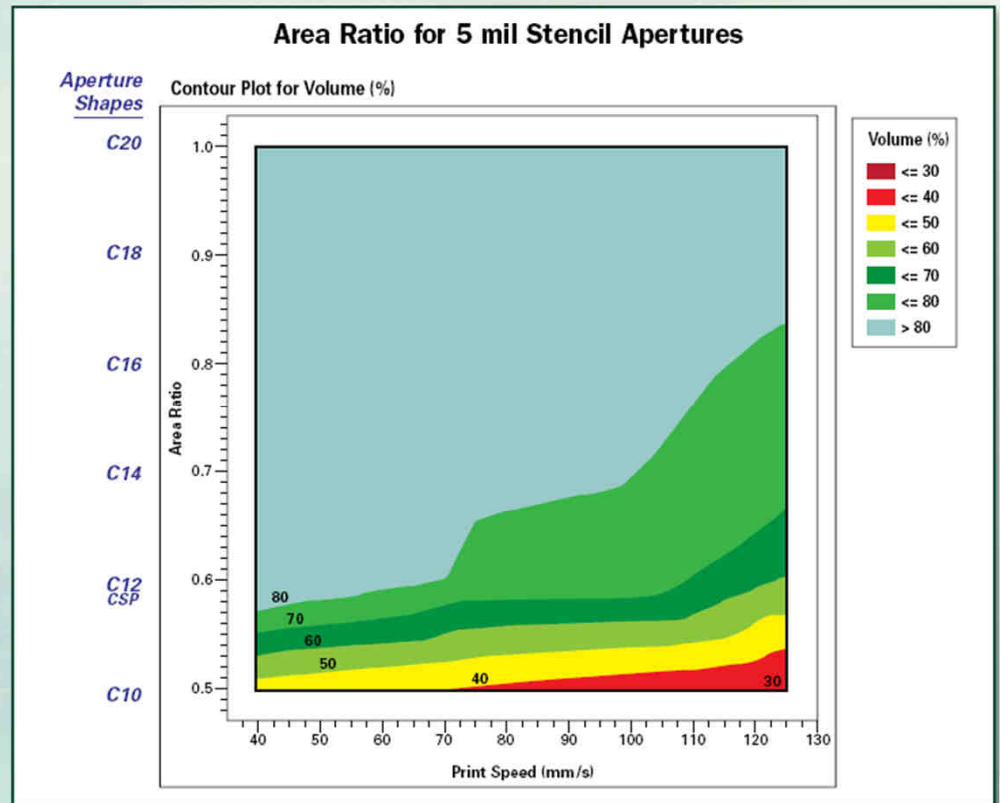
- Paste properties
 - High transfer efficiency
 - Oxidation barrier
 - Long stencil life & response to pause
 - Increased activity

12-mil Round Apertures
5-mil Laser cut Electropolished stencil
 100mm/sec



PCB ID within RTP

Transfer Efficiency (Volume%):



Conclusion

- Random HIP Defects
 - Look for supplier / storage issues
- Edge / Center HIP Defects
 - Look for process issues (placement / warpage)
- Paste properties can overcome HIP defects
 - Look for high transfer efficiency
 - Look for “stringy” pastes
 - Look for a high oxidation barrier
 - Look for slump resistance
- You are not alone

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Mario Scalzo is a Senior Technical Support Engineer for Indium Corporation and is located at their global headquarters, in Clinton, NY.

Mario supports all of Indium's current product lines, with emphasis on advanced surface mount (SMT) problem solving. He has worked closely with the Asian & North American regional teams on several customer projects, including a long-term assignment with Indium's Asia-Pacific Operations in Singapore.

Mario joined Indium in 2000 as a Quality Flux Technician, and spent 2 years as a Quality Engineer. This troubleshooting experience has given him a depth-of-knowledge beyond the normal product training and taught him how to anticipate customer concerns.

Mario is active in several industry organizations, including the Surface Mount Technology Association (SMTA) and the American Chemical Society (ACS). He has presented at several conferences nationally and internationally.

Mario has a bachelor's in chemistry from Saint Anselm College, with a certificate from the American Chemical Society for Professional Education and minors in Physics and Fine Art. He is an SMTA-certified SMT Process Engineer, an IPC A-600/610 Certified Inspection Specialist and has earned his Six Sigma Black Belt from Dartmouth College's Thayer School of Engineering.