



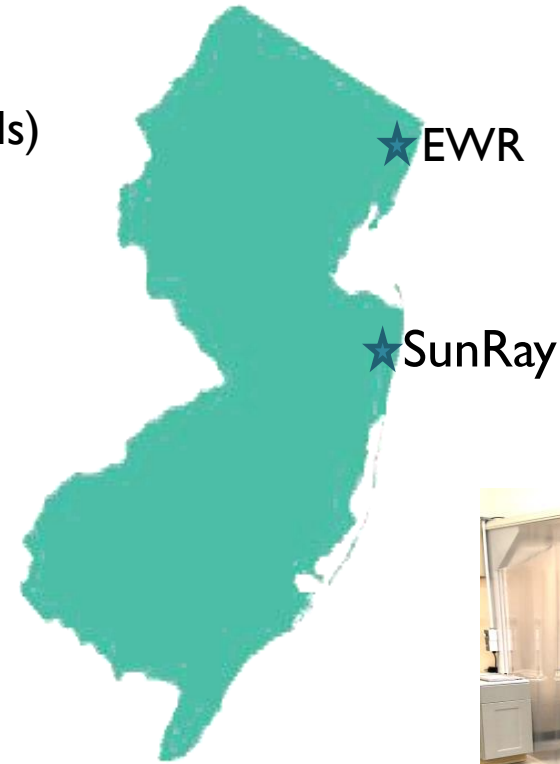
SUNRAY
SCIENTIFIC

RUTGERS IJOBS PRESENTATION

***DELIVERING NEXT GENERATION INTERCONNECT
SOLUTIONS FOR THE ELECTRONICS WORLD***

FACILITY & RESOURCES

- Located in Eatontown, NJ, USA
- Engineering and R&D (Electrical, Mechanical and Materials)
- Prototyping Capabilities
- Alpha and Beta Validation
- Automated SMT Line, DEK & ATMA Printers, & 2 Heller Reflow Ovens
- In-house Customer Qualification Capability
- Materials Manufacturing



TECHNOLOGY PORTFOLIO

Complimentary High-Performance Products

ZTACH® ACE

Anisotropic Conductive Epoxy – Thermal or UV Cure

- Course – 200+ microns
- Fine – 100-200 microns
- Ultrafine – <100 microns (in development)

Conductive Ag Inks

Flexible, Stretchable Conductive Silver Inks

Encapsulation & Protection

UV Cured Flexible Encapsulants

Epoxies

Highly flexible, low-temp cure, reduced Ag, Conductive Epoxies



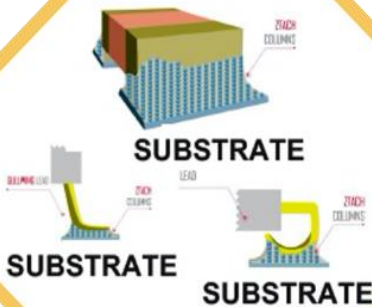
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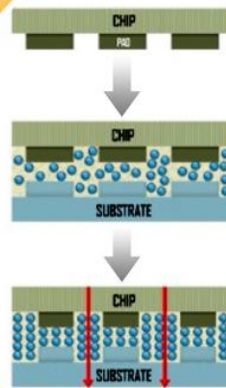
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SUNRAY SCIENTIFIC – PRINTED ELECTRONICS & ELECTRICAL INTERCONNECT SOLUTIONS

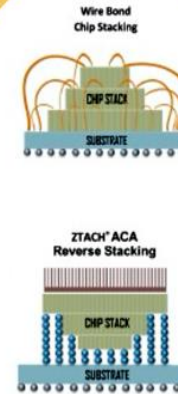
Leaded Components



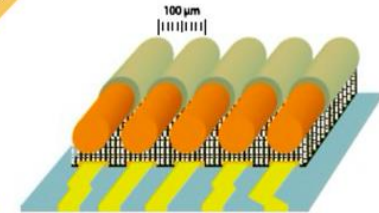
Flip Chip Bare Die



Chip Stacking



Ultra-Fine Wire Attach



Markets

- Medical/Wellness
- Automotive
- Consumer Electronics
- MIL/Aerospace
- Industrial
- White Goods/Appliance
- ...Expanding

Applications

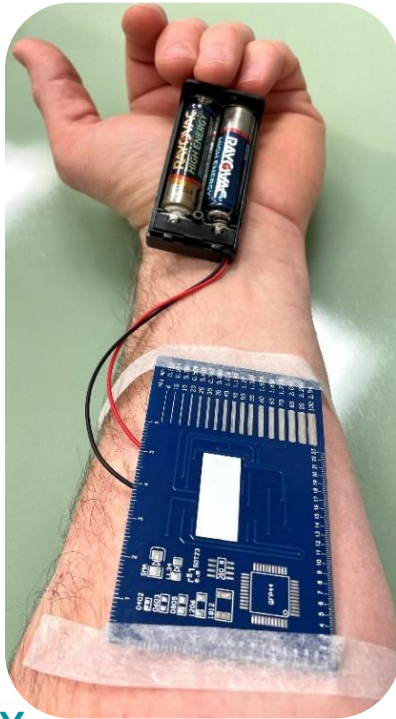
- Flexible Hybrid Electronics
- Wearable Diagnostics
- Smart Clothing
- RFID tags & labels
- Printed Sensors
- Wireless Communications
- Flip-Chip/Die-Attach
- Semiconductor Packaging



MOVING FROM THE PROBLEM, TO THE SOLUTION

SunRay's patented conductive adhesive technology helps make electronic circuitry flexible

Taking you from...



To...

OUR MATERIALS

Reduce Footprint



Reduce Weight



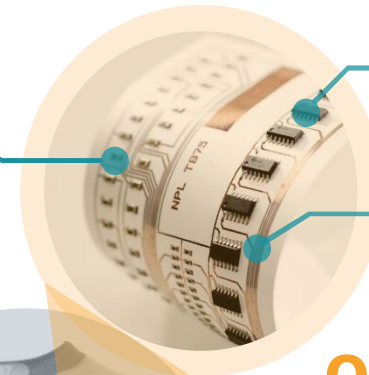
Improve Bond



Improve Durability



Flexible Encapsulants



ZTACH® ACE Anisotropic Conductive Epoxy

FlexS Conductive Silver Inks

OUR PRODUCTION

Cost effective



Energy efficient



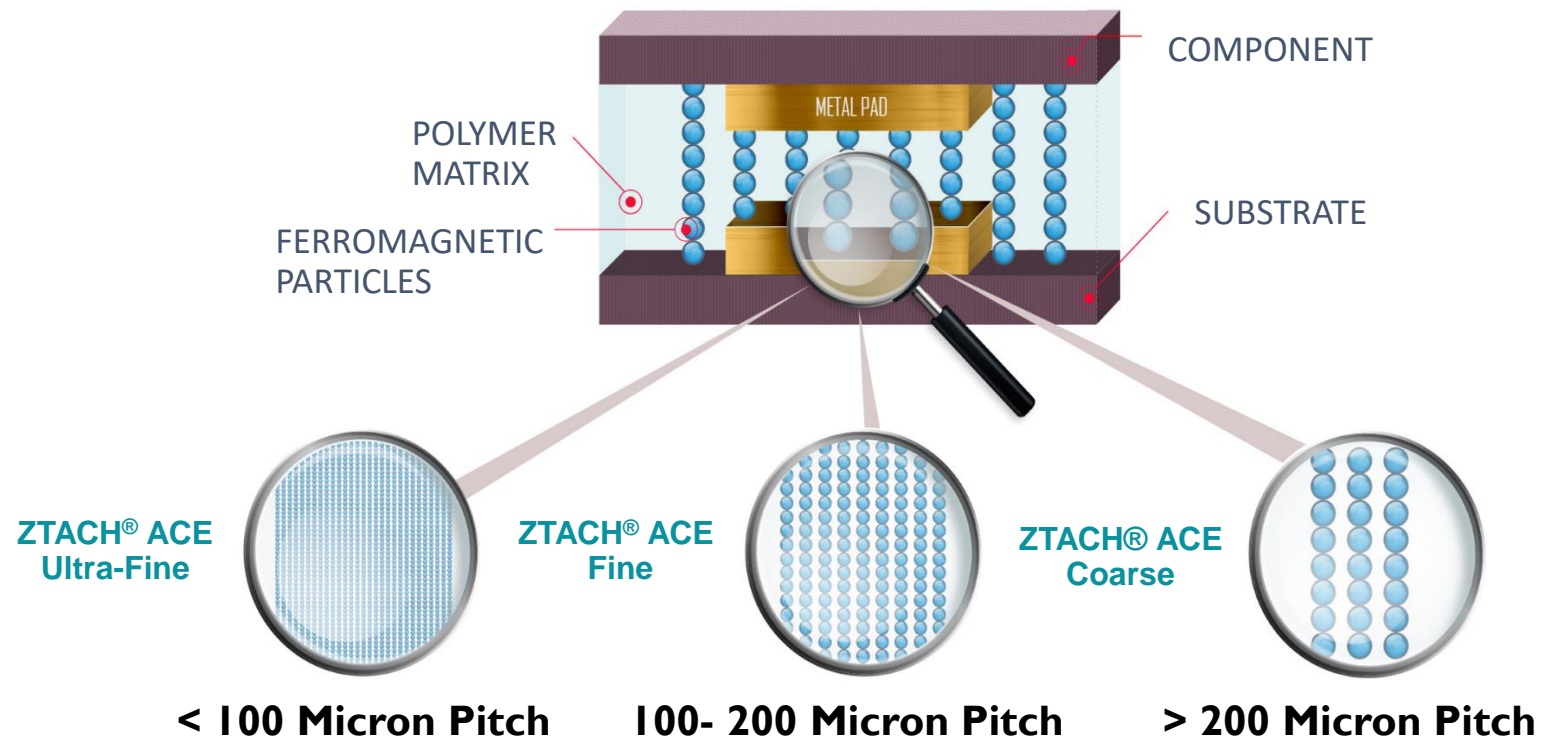
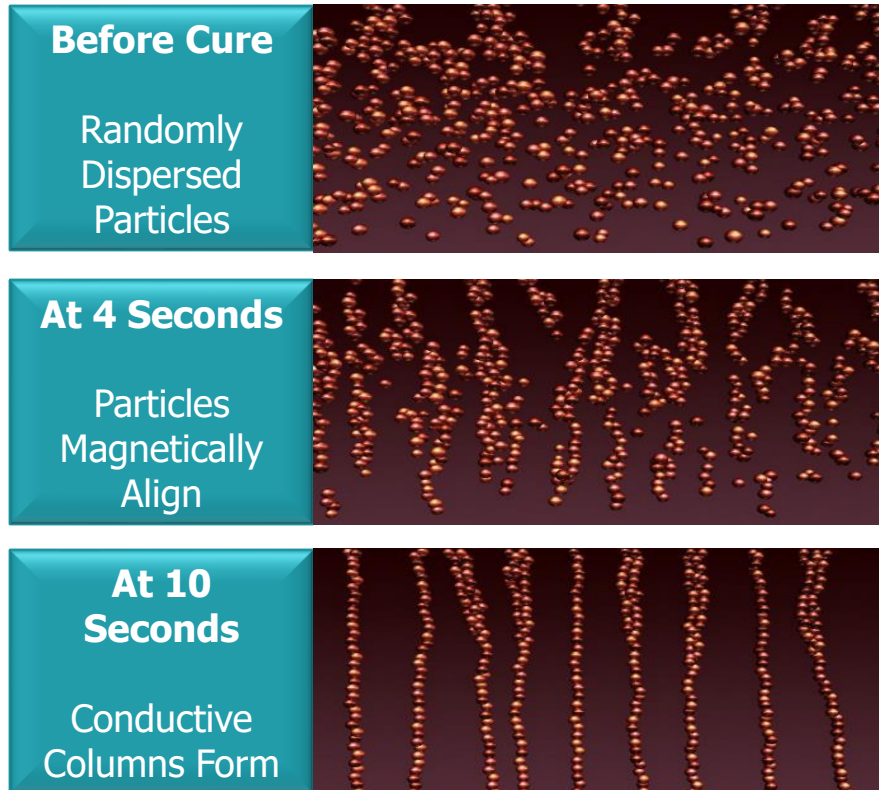
Environmentally friendly



Domestic production



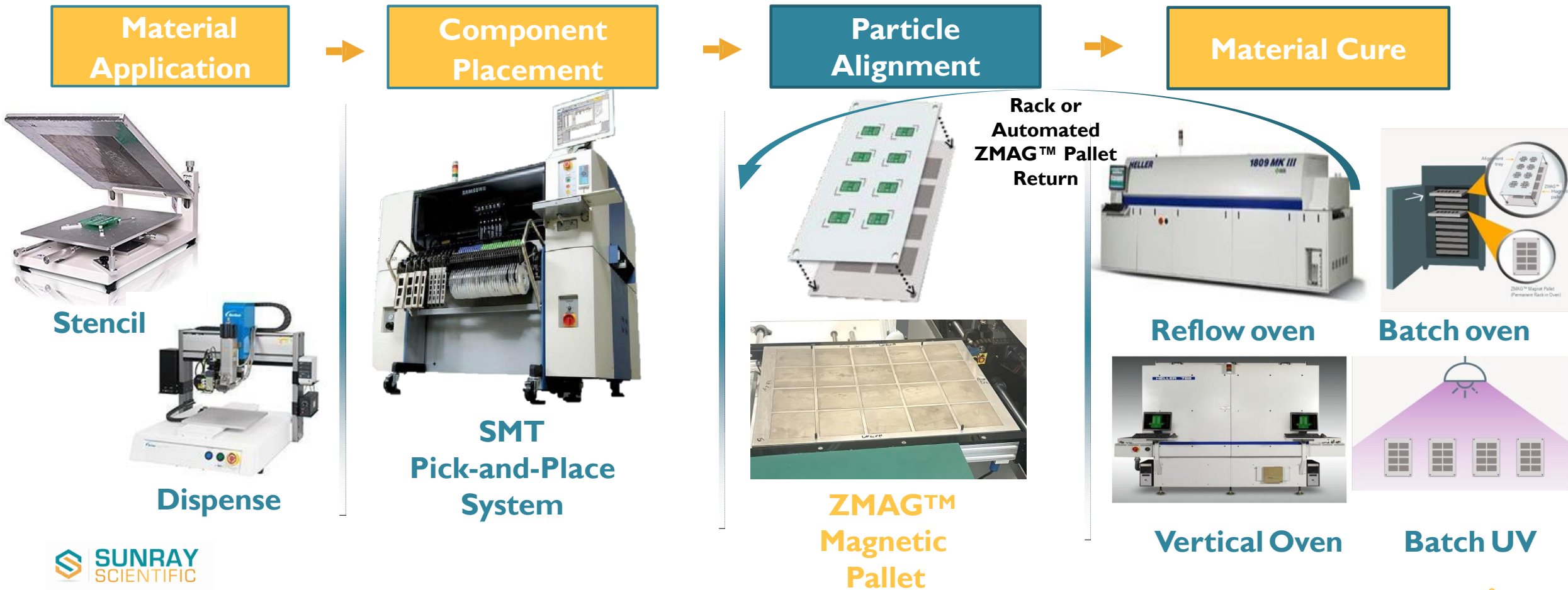
ZTACH® ACE: REVOLUTIONIZING ELECTRICAL INTERCONNECTION



ZTACH[®] ACE COLUMN FORMATION



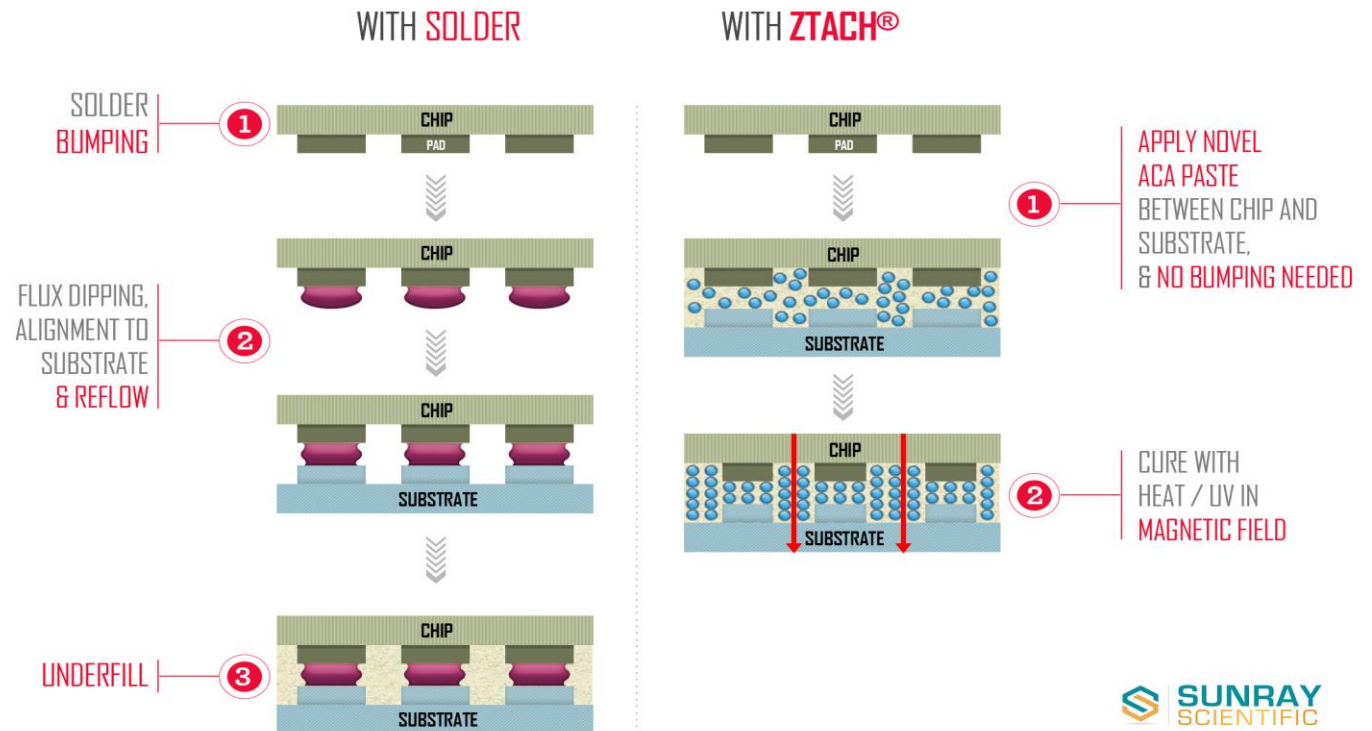
ZTACH® ACE: FULLY SCALABLE MFG. ON EXISTING SMT LINES



THE ZTACH[®] ACETECHNOLOGY AND COST ADVANTAGE

Flip-Chip or WL Packages

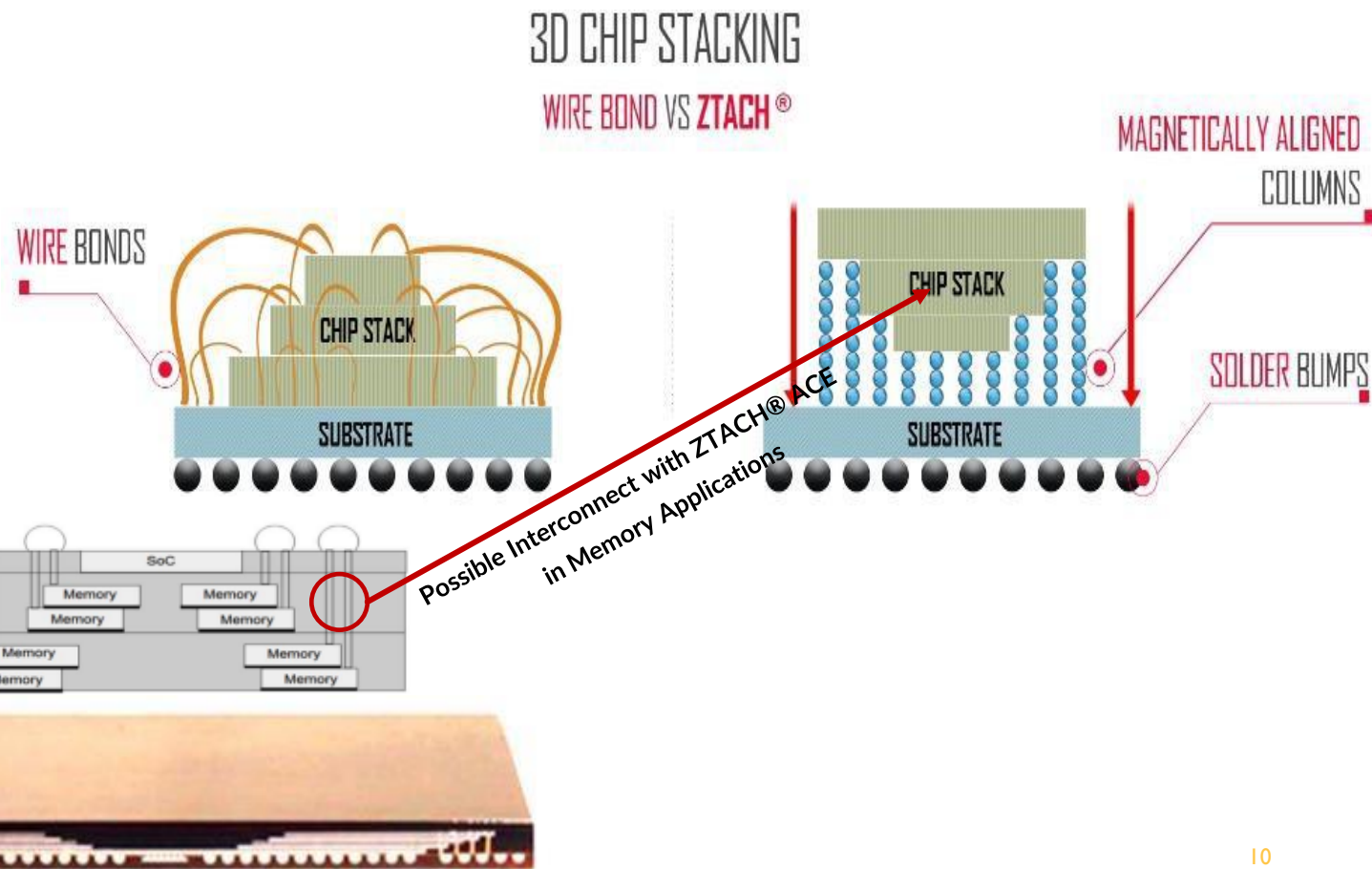
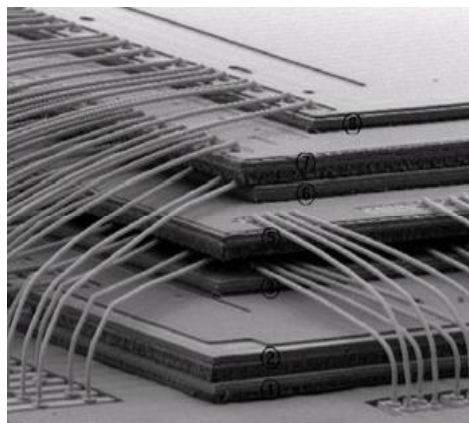
- ✓ Reduced BOM
- ✓ Reduced mfg. steps
- ✓ Stronger Bond
- ✓ Greater flexibility



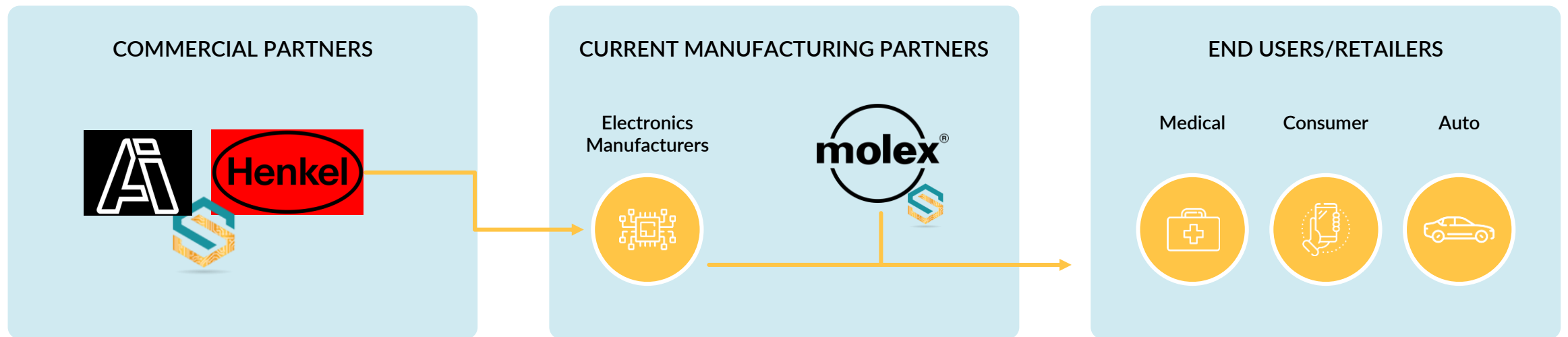
THE ZTACH® ACE TECHNOLOGY AND COST ADVANTAGE

ZTACH® ACE Benefits:

- Eliminates wire bonds
- Reduces parasitic
- Enables miniaturization
- Low profile
- Greater thermal dissipation possibilities



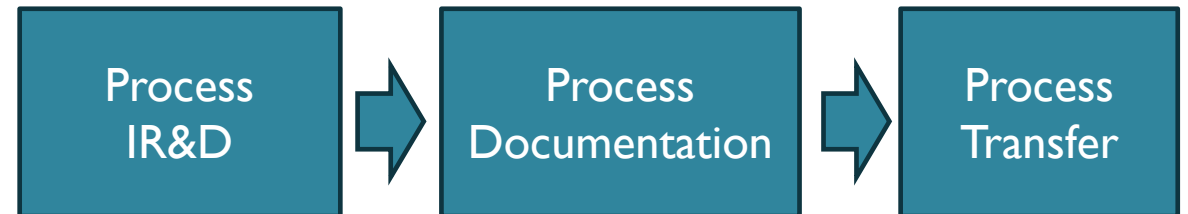
OUR COMPETITORS ARE BECOMING OUR PARTNERS...



Our customers told us what they needed, that wasn't available, so we built it.
Direct access to multiple industries and multi-billion-dollar sales channels.

MATERIALS IR&D APPROACH

- SunRay scientific is a Materials Company
- Bringing a new product to market necessitates training the customers
 - Existing technologies have built-in infrastructure and know-how
- This allows for process development with results that can be shared
 - This is likely more in-line with the academic approach



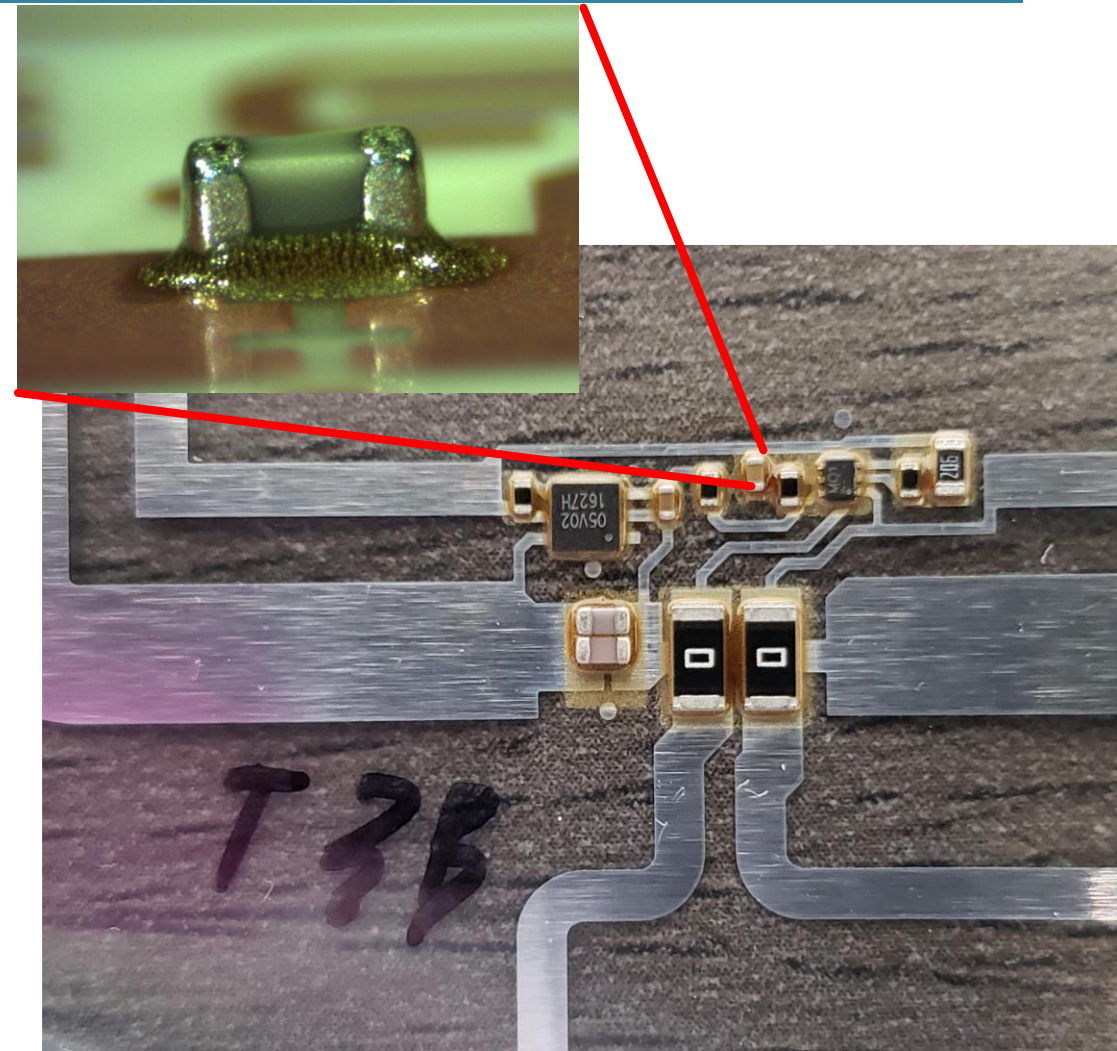
PROPOSED PROJECT / POSTDOC POSITION

UV ZTACH for RFID/NFC/loT applications

- Duration: 2 years
- Purpose: Refine UV ZTACH Manufacturing process and transfer process
- Goal: High-volume distributed sensor manufacturing with significantly reduced cost and greenhouse gas emissions.
- Useful Background: Research, Electronics, Manufacturing, Materials Science, Chemistry



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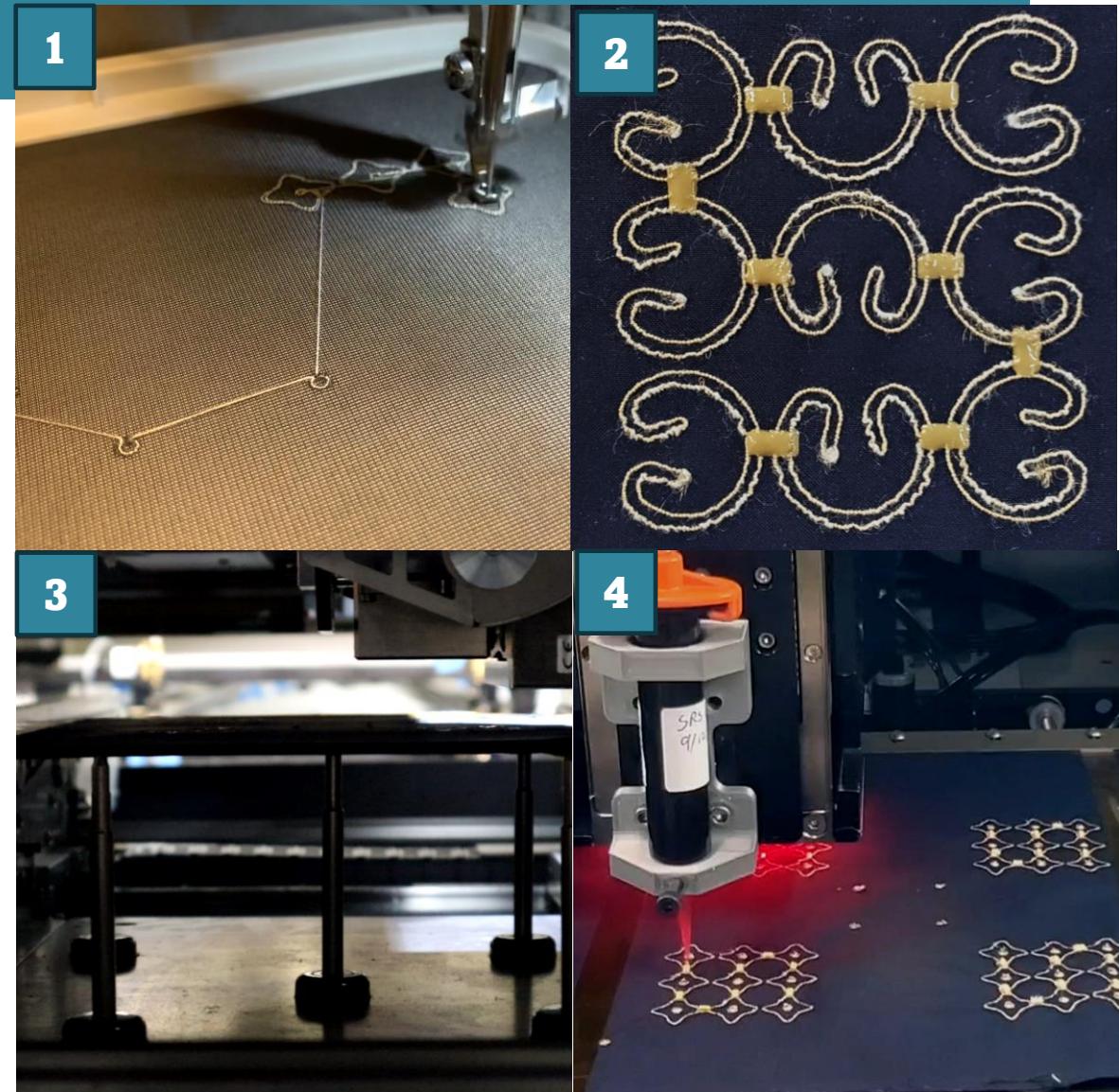
PROPOSED PROJECT / POSTDOC POSITION

Medical Wearables with ZTACH

- Duration: 2 years
- Objective: Refine the process for integrating electronics directly into textile circuits.
- Output: An entirely new materials set for medical applications, opening doors for biomonitoring and health.
- Useful Background: Research, Medical Devices, Manufacturing, Materials Science, Chemistry



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PARTNERING WITH SUNRAY

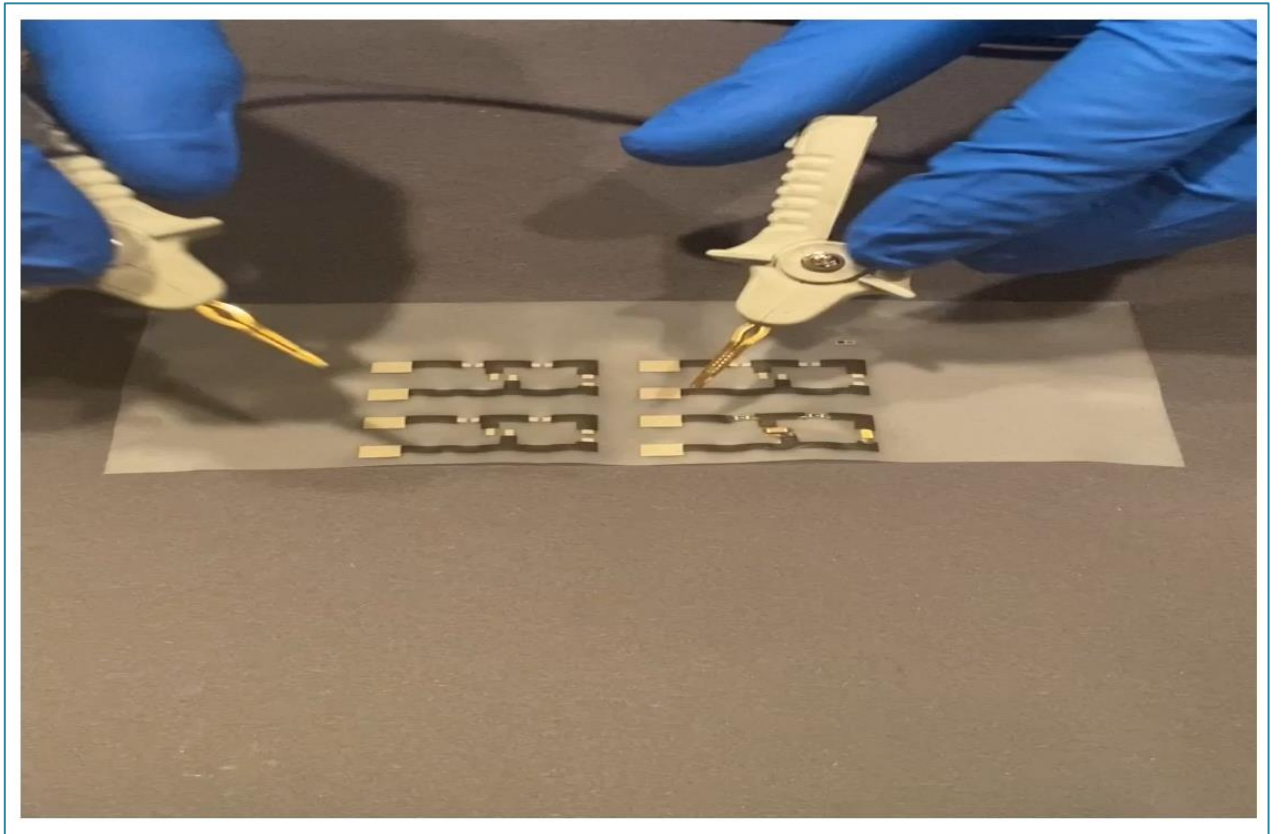
- Opportunity for growth within the company;
 - we've grown 3x in the last 3 years
- Mentorship is key within our company culture
- Please reach out if interested
(valerie@sunrayscientific.com)

APPENDIX

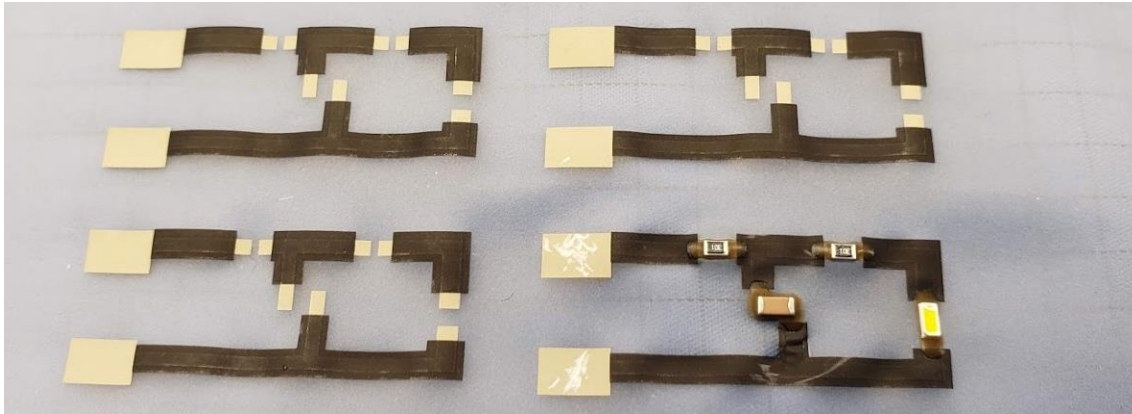
ROBUST & WEARABLE FHE – ENABLED BY ZTACH[®] ACE



BINGHAMTON UNIVERSITY
STATE UNIVERSITY OF NEW YORK



PRINTABLE, RELIABLE INTERCONNECTIONS FOR WEARABLE, FLEXIBLE HYBRID ELECTRONICS



Industry

- Flexible Wearables
- Medical monitoring

Requirements

- Interconnect able to withstand repeated stress without losing continuity

Problem

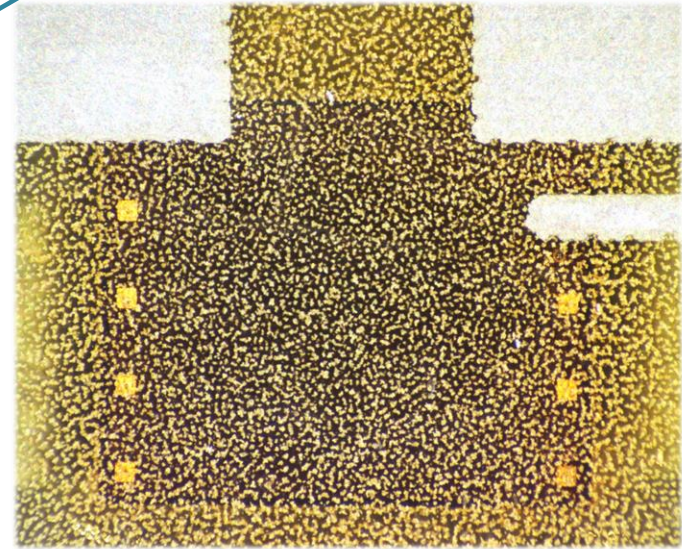
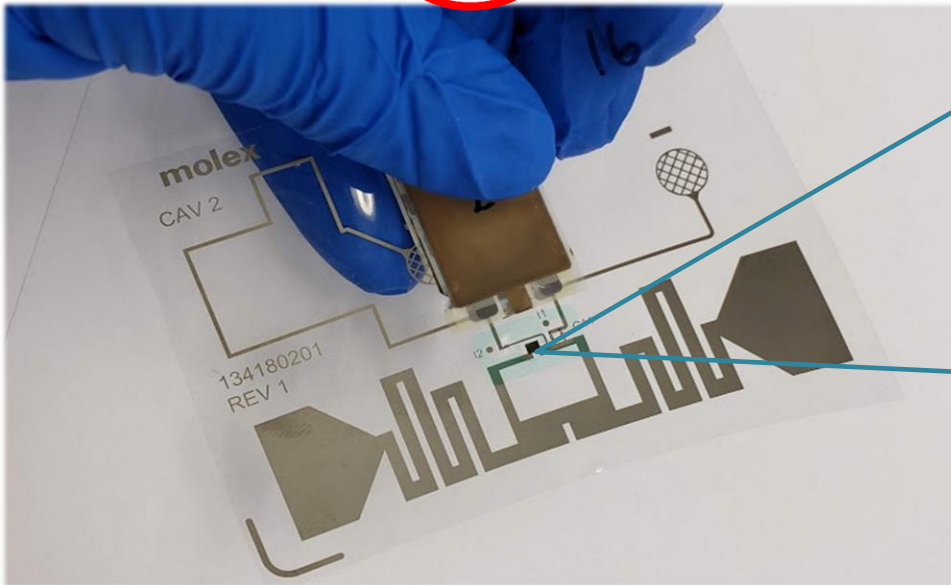
- Thermoplastic Polyurethane (TPU) is very temperature sensitive
- TPU is difficult to bond to
- End application will see high cyclic stress

Solution

- Attach passive components to NAMICS stretchable ink with ZTACH® ACE to evaluate wearable system performance
 - ✓ Low contact resistance
 - ✓ Improve adhesion
 - ✓ Acts as its own underfill and encapsulant
 - ✓ Holds up to repeated wash cycles, flex and stretching



CASE STUDY: ULTRA-THIN BARE DIE ATTACH WITH ZTACH[®] ACE



CASE STUDY: ULTRA-THIN BARE DIE ATTACH WITH ZTACH® ACE

Industry

- Flexible printed RFID Tag

Requirements

- High adhesion and reliability
- Ag-ink to bare die connection
- Volume production capable
- RF Capable interconnect material
- Maintain flexibility and low-profile of ultra-thin high-performance chip
- No corrosion between interconnect material and bare-die pads

Problems with Current Technology

- Non-planar Die
- Tight Pitch
- Slow process
- Yield loss due to alignment issues

Solution

- Thermal-cure ZTACH® ACE
- Z-axis interconnection eliminates pad to die alignment issues
- Creates underfill and encapsulant in one layer resulting in improved bond strength



SUNRAY ZTACH[®] ACE: FEATURES & BENEFITS



APPLICATIONS

- ❑ Flexible Hybridized Electronics
- ❑ Bare Die Attach
- ❑ Stretchable/Wearable
- ❑ Semiconductor Packaging / Stacked die
- ❑ Flex-to-flex and/or rigid-to flex connections

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HIGH-PERFORMANCE

- ❑ Superior Adhesion
- ❑ Fine Pitch Capability (<100 Microns)
- ❑ High-density capability
- ❑ Bonding Reliability & Package Strength
- ❑ Increased Thermal Dissipation

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DESIGN FLEXIBILITY

- ❑ Smaller components
- ❑ Wider range of substrate materials
- ❑ No solder bumps needed
- ❑ Non-planar capability
- ❑ Multi-Component Assembly

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MANUFACTURING OPERATIONS

- ❑ No Underfill Required or encapsulation required
- ❑ No Patterning Required
- ❑ Pressure-less, low temp and UV cure processing
- ❑ Standard SMT Equipment
- ❑ 100% Solids, Zero VOC