



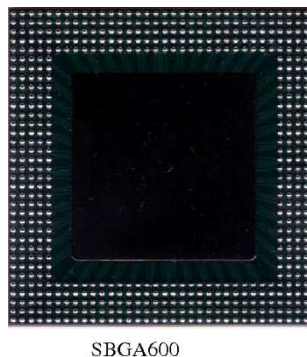
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Indium Inks and Pastes for High-Resolution, High-Density Printed Electronics

Technology / Capability Overview:

The technology presented is nanoparticle dispersions (inks and pastes) of indium sub-micron particles for printing indium circuits and solder joints for next-generation electronics packaging and quantum computing.

- 10x smaller indium particle size vs commercially available solder powder.
- Printing smaller features size and higher solder joint density for improved SWaP.
- Robust even at cryogenic temperatures (Space) and high-G (Weapons).
- Superconductor for quantum computing
- Indium alloys also possible.



SBGA600

Relevance to Combatant Command or other Need:

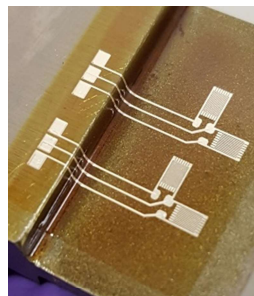
Category* : C2/C4I/Cyber, Operations & Mission Support, Weapons

- Development of materials for next generation electronic packaging to reduce SWaP across all sensor modalities (**C2/C4I/Cyber – Sensors & Radar**).
- Materials capable of printing less than 20-micron resolution for high density interconnects for next-generation electronic packaging leading to more Persistent ISR (**Operations & Mission Support**).
- Materials for operation in high temperature (400°C), including hypersonic weapons (**Weapons, Kinetic Engagement Options**), cryogenic temperatures (**Space**), and high neutron-flux (core of nuclear reactor) environments.

Past Performance of Technology and Company:

Development of Indium ink is built on our demonstrated capability of producing and selling a wide variety of ink and paste formulations, including:

- | | |
|------------------------|----------------------------|
| • Copper | • Molybdenum* |
| • Nickel | • Niobium* |
| • Copper-nickel alloys | • Zirconium* |
| • Aluminum | *prototype (beta) products |
| • Silver | |



CuNi Strain Gauge

Developed formulations for a wide variety of printing platforms.

Maturity / Scalability / Cost / Schedule

TRL : 4 for Indium ink products

We have a unique indium ink formulations today but need additional effort to add flux chemistry for electronic packaging applications.

SCALING CONSIDERATIONS: Can produce 25kg/year. Minimum order is 100gm for all our inks.

TIME TO MARKET WITH CURRENT FINANCIAL PLANS: Indium ink product about 12-24 months away. Prototype sales already at \$10,000 in 2021. Other ink and paste materials are being sold today (\$100,000 annual product sales).

TIME TO MARKET WITH FINANCIAL ASSISTANCE: Indium ink product 3-6 months with financial and technical assistance.