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Technology Opportunity

Room temperature compressed air-stable conductive copper films

A continuous-flow process producing oxidation-resistant copper inks that form air-stable, high-conductivity films at room temperature for low-cost, scalable flexible electronic components.

In Brief

This invention uses a natural polymer to produce **air-stable copper particles**. These particles are prepared through compression at **room temperature without sintering**. As an ink, this technology can form **conductive films** on a wide range of heat-sensitive substrates enabling **flexible printed electronics**. A **PCT patent** has been published (WO2025022126A1) and this **TRL 4** technology available for licensing, co-development or commercial partnerships.

Key Benefits

- Room temperature, sintering-free copper inks
- Air-stable, high-conductivity films
- Scalable continuous flow production
- Designed for flexible electronics

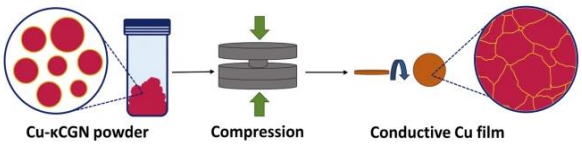

Fig 1: Schematic representation showing fabrication of Cu films

Technical Summary

This technology uses biopolymer-stabilised copper particles that compress at room temperature to form air-stable, low-porosity (<4.6%) conductive films with low resistivity (2.05 $\times 10^{-8}$ Ωm at 20 °C). Sub-micron particle sizes (~227 nm) deliver precise, high-performance films, and the aqueous ink is compatible with pen-based and printing deposition methods on substrates, including paper, plastics, and textiles.

This sintering-free method has been demonstrated at gram scale and through continuous flow production, supporting cost-effective scalability, rapid prototyping and on-demand manufacturing for flexible electronic components.

At TRL 4, the technology is suited to RFID, flexible circuits, wearable sensors, and other next-generation printed electronics. Compared with conventional silver and copper inks, it combines metallic-level conductivity, oxidation resistance, and compatibility with heat-sensitive substrates, while reducing reliance on costly or energy intensive metals.

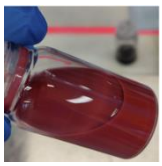

Fig 2: lab-prepared Cu ink

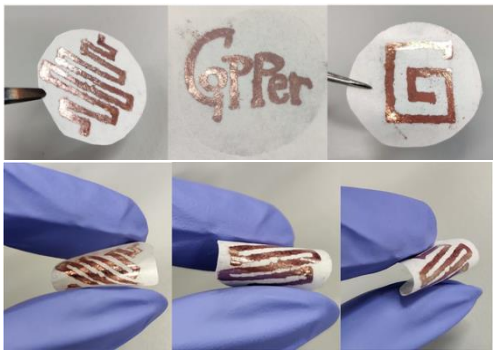

Fig 3: various Cu patterns on filter paper and physical deformation - no delamination of the Cu film occurs upon bending

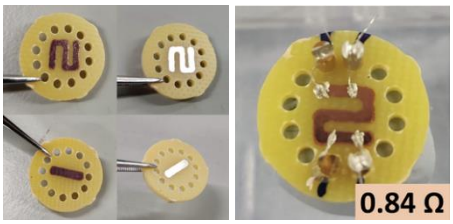

Fig 4: smooth and highly reflective Cu patterns on PCB substrates and a typical sample used for four-terminal electrical measurements of films on PCB substrates

Parameters	TRL 4 Cu-ink	Commercial Ag-ink
Resistivity	2.0–2.3 x10^{-8} Ωm at 20 °C	1.8 x10^{-5} Ωm at 150 °C
Conductivity	6.74 x10^{6} (S/m)	6.3 x10^{7} (S/m)
Processing	None	Thermal or photonic sintering (80–200 °C)

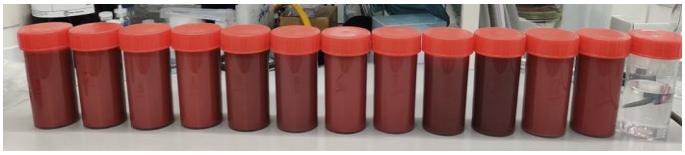

Fig 5: Cu ink produced at larger scale in a continuous flow reactor

More details: Pereira H. J., Makarovsky O., Amabilino D. B., et al., npj Flex. Electron., 2024, 8, 44.

Commercial Enquiries

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