

# *Development of Materials for High Temperature Interconnect*

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Gwent Group

## The Gwent Group

Gwent Electronic Materials is one of a family of companies known as The Gwent Group

**Gwent Electronic Materials Ltd.**

Applied Enzyme Technology Ltd.

Gwent Biotechnology Ltd.

Gwent Sensors Ltd.

LRH Ltd.

## History

- Founded 1988 in Pontypool, South Wales
- Combining the skills and experience of a multi-disciplinary team allows the company to specialise in production of custom-made materials for the electronics industries.

## Business Types

- Manufacturer of electronic materials
- Contracted research
- Partner in government funded projects
- Direct support of university research projects
- Toll manufacturing
- Consultancy

## Operation Principals

- Work directly with customers to make materials that exactly suit their manufacturing process
- Provide technical support to customers
- Capability to mimic production scale printing in our print room, and thus ensure suitability and quality of product.

## Dispersion Methods

- Three Roll Milling: 1-100kg batches
- Bead Milling: 1-25kg batches
- Torus Milling: 7- 500kg batches



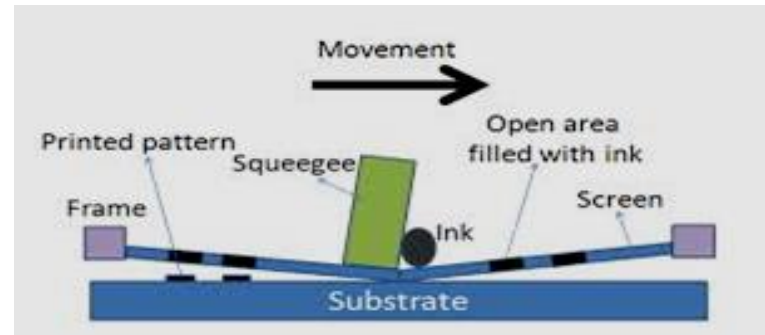
## Printing Capability

- Semi Automatic Printing 300x300mm
- Laboratory Printing 150 x 150 mm
- Tunnel Firing Furnace
- Batch ovens and furnaces



## Our Expertise

- Polymer Science
- Ceramic Processing
- Powdered Metals Technology
- Dispersion Technology
- Printing and Deposition

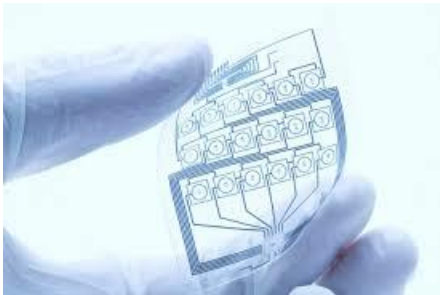




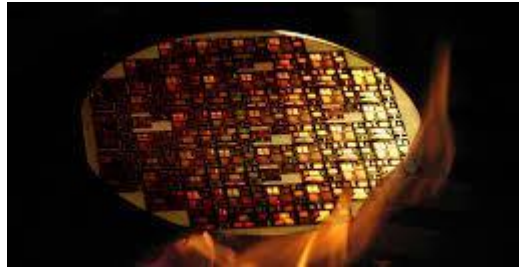
## Industries we supply



Electroluminescent  
Materials



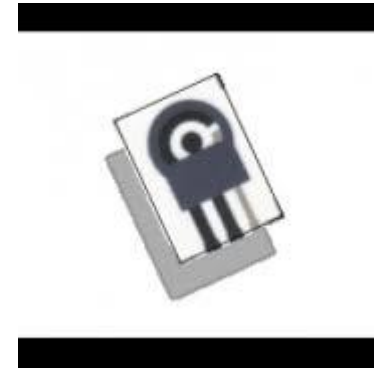
Flexible electronics



High Temperature  
Electronics



Electro-ceramics



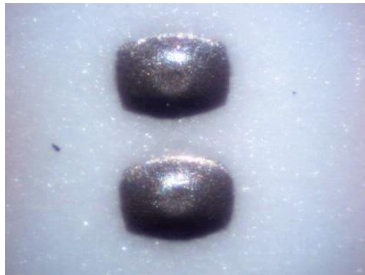
Biosensors

## ELCOSINT

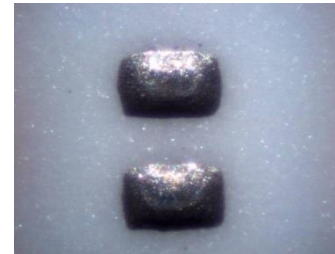
- This project has seen the development of high temperature conductive adhesives
- We have delivered a silicone-based adhesive that will function at the upper operating temperature of the system, for the life of the component
- We have investigated combining the nano and macro Ag particulates with the silicone based resin formulations

## Preliminary formulations

- Different morphologies of silver powders within the matrix and the effects on conductivity were evaluated
- Investigated the use of Silver Flake / Silver Powder Ratios to improve print quality. The use of 50/50 ratio of Flake/Powder reduced the flow of the ink.
- Investigated the use of oily solvents to improve print quality. Level of flow was improved, the level of tack was reduced.



*Without oily solvent*

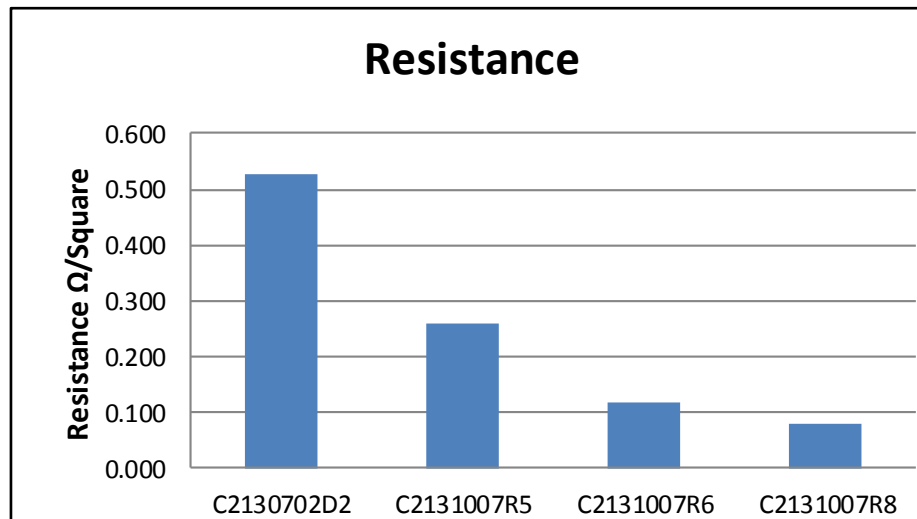


*With oily solvent*

This ink cleared the stencil, there were no tails on the pads, however the pads started to lose the sharp edges

## Silvers Powder

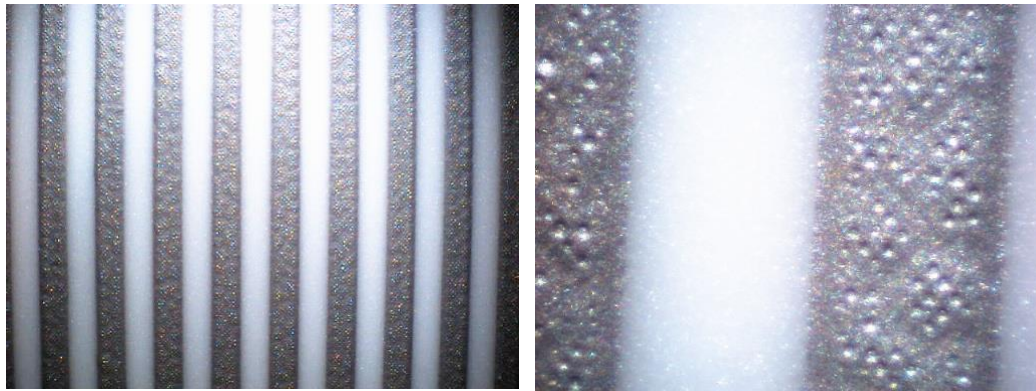
- Investigated the use of different Silver Flakes and Silver powders to improve the conductivity of the ink



- The resistance of the C2131007D5 ink was less than half the D2, consequently both these formulations were selected as candidates for further development.

## Sinterable materials

- Sinterable materials were developed using metallorganic and nano-sized particles



*C2140127R2 Silver with Nano-silver powder additive*

- Normalised Resistance@25um 41mOhms/square and ink prints very well too.
- This was the lowest normalised resistance of the sinterable products we made and was included in the candidates for further development.

## Further Developments

- Preferred candidates C2130702D2, C2131007D5 & C2140127D2 were chosen for full process trials with demonstrator build and evaluation
- All three of the preferred candidates have been further developed by small alterations to the formulations to increase stand-off height (larger particles incorporated) and increase screen life (higher boiling point solvent incorporated).
- These materials were supplied to MSL for building of Demonstrators

## Project Outcomes

- GEM now has a range of new high temperature interconnect materials, that provide a viable alternative to solder.
- Utilising the data obtained by NPL, we can market our products to MSL, and other companies, and increase our sales in the sector.
- The team will continue to work together, in the TAMESSA project, advancing materials technology for high temperature applications.