

Industrial Member Report Summary – Key Findings for Industry

Development of a Test for Encapsulants for Implantable Electronic Medical Devices

TWI Core Research Programme

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Industrial need

The medical industry requires new developments in technology for micro-devices. In particular, there is an increase in the use of electronics and sensors for implants, and a need for a change in the materials used for encapsulation. There would be many benefits in using only a polymeric encapsulant rather than the traditional metallic box solution. Challenges in this area include understanding and monitoring the failure mechanisms in a biological environment, and designing a suitable accelerated test. In this project, testing is considered for silicon devices and thick film sensors in a salt water solution. Voltage readings were monitored, to detect early failure of the components.

Key Findings

- A novel test has been developed successfully to determine the effectiveness of coatings to protect electronic assemblies from aqueous solutions.
- Test equipment allows the key variables of voltage, temperature and aqueous environment to be controlled and varied using a standardised specimen geometry so that different coatings can be compared.
- One established epoxy and one silicone were tested. The epoxy was found to give a longer lifetime.
- Dendrite growth was identified on the interdigitated pattern test board, indicating a significant film of water developed at the interface, capable of supporting metal ion transport.
- On the MOSFET test cell, corrosion was identified on aluminium pads, and a red phase formed on gold thick film stepping stones. This indicates at least local areas of moisture penetration through the coating.
- Early results show that failure mechanisms can be linked to voltage measurements in active devices and sensors.

How to benefit from this work:

- As an Industrial Member of TWI, you have free access to the [full report](#)
- If you are not an Industrial Member of TWI, find out how your company could benefit from Membership www.twi.co.uk/membership
- Contact Helen Goddin (helen.goddin@twi.co.uk) to learn more

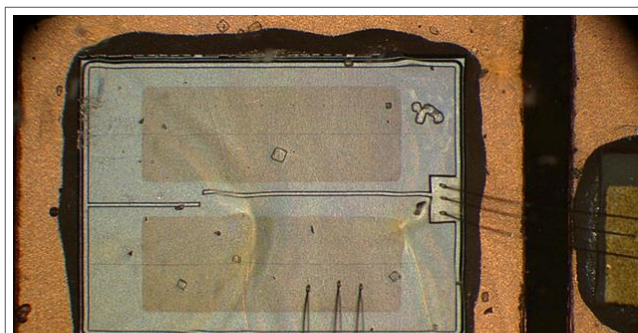


Figure 1 MOSFET test cell following testing in saltwater solution.

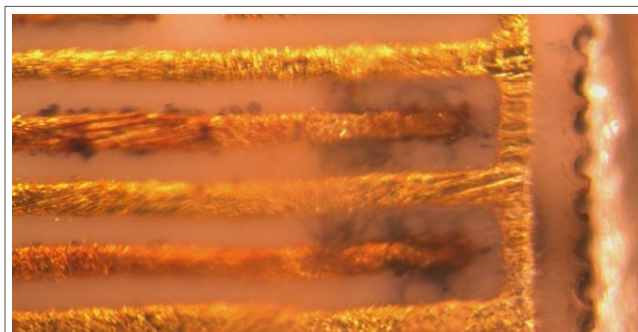


Figure 2 Interdigitated patterned test board following testing in saltwater solution.