Biocompatible packaging

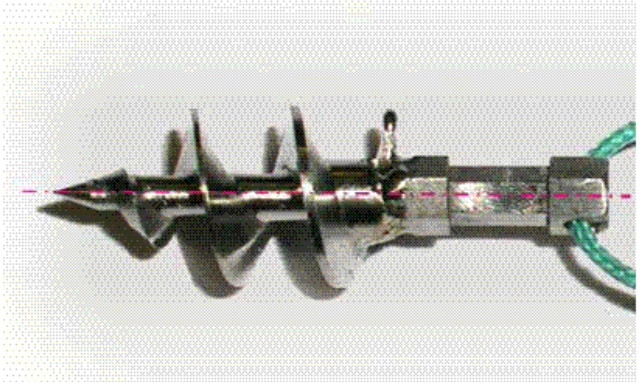
Parylene and PDMS coating of electronic substrates

Overview

- Applications
  - Challenges
- Practical
  - Coating tests
  - Results
- Conclusion

Applications

- Monitoring, stimulation and healing
- Examples from our group:
  - Dental/orthopedic implant monitoring
  - Fetal ECG monitoring
  - Endoscopic capsule
  - Pressure measurements

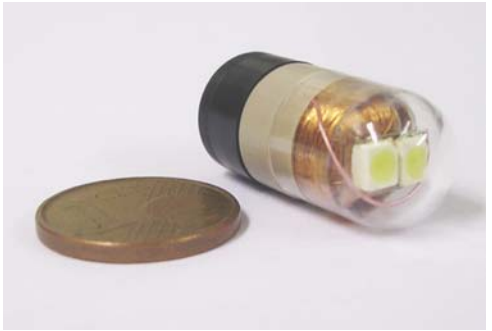


Applications: packaging

- Three types of materials:
  - Bio-incompatible
    - Most materials
    - Body reacts with inflammation, scar tissue, etc.
  - Bio-compatible
    - Stainless steel, PMMA
    - No reaction from the body
  - Bio-active
    - Titanium
    - Beneficial reaction from the body
- For temporary implants: bio-compatible

Challenges

- Bio-compatibility
  - Low wear / low debris formation
  - Resistant to body fluids
  - No other adverse reactions
- Possibility for read-out
  - Inductive link
- Easy application of coating
  - Not too many design constraints (e.g. T, P, …)



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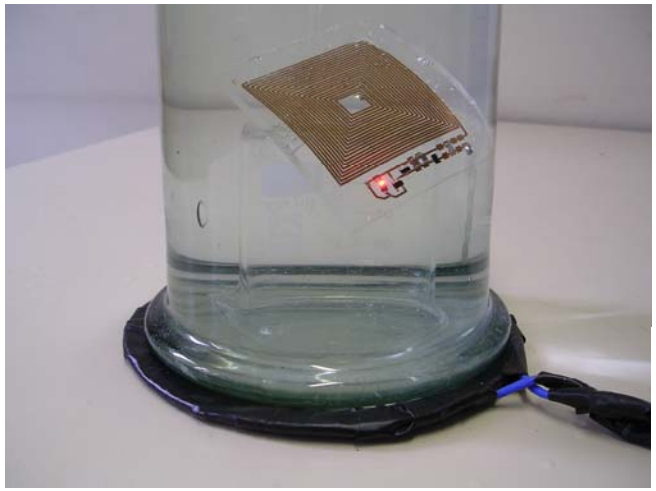
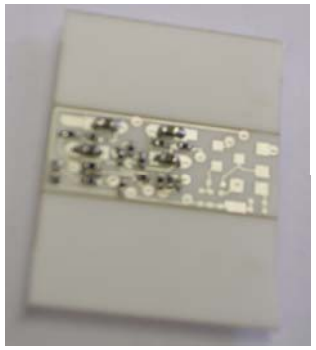
Practical

- PDMS-based coating:
  - Flexible, useful for flexprint
  - Thick layers
  - Usable as substrate
- Parylene coating:
  - Biocompatible material
  - Electric isolator
  - Good step coverage

Coating tests

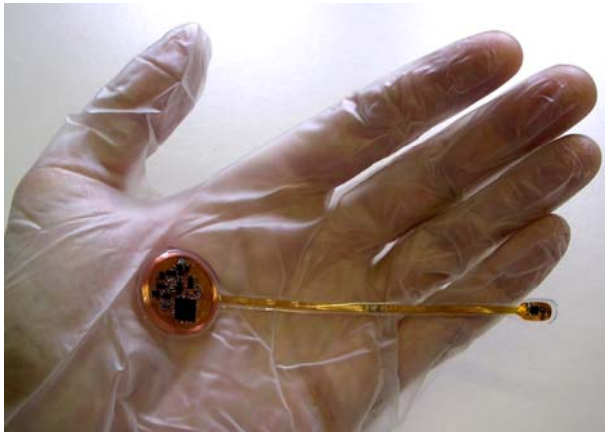
- PDMS:
  - At our own facilities
  - Thickness in mm range
  - Circuit on PDMS
- Parylene:
  - Performed at Qinetiq
  - Coating thickness 10 - 25 µm
  - On an alumina substrate with ECG circuit

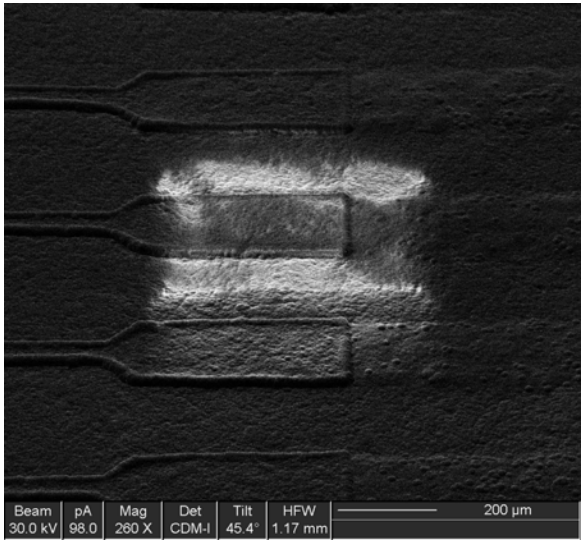




Coating results

- PDMS coating:
  - First tests: no leaks
  - In vivo tests
- Parylene coating:
  - Cut for cross-section
  - FIB imaging
  - No visible defects
  - Other tests were planned





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Conclusion

- Parylene coating shows great promise
  - No visible defects
  - Good step coverage
  - Usable for non-medical applications
- Acquisition of our own parylene coater

Questions?

- General questions for me
- Specific questions to Bart: bart.hermans@esat.kuleuven.be
- Interested in an application: maarten.driesen@esat.kuleuven.be