

Potential applications for bio-sensing technology for environmental testing/monitoring.

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‘Biology for Sensors and Sensors for Biology’

1. Introduction

"We are the leading public body for protecting and improving the environment in England and Wales. It's our job to make sure that air, land and water are looked after by everyone in today's society, so that tomorrow's generations inherit a cleaner, healthier world."

2. Environmental Monitoring

- Diverse range of regulation, monitoring & scientific activities
- Monitoring obligations arise from UK or European legislation or from existing national and international commitments
- Monitoring is needed to determine quality and provide a measure of improvement

3. Water Quality Monitoring

- Around 80% of monitoring activity is collection and laboratory analysis of water samples
- Inefficiencies due to mass transport of bottles to centralised labs, delay in getting results, sample degradation, expensive analysis
- System has been heavily integrated – not easy to identify quick wins

4. The need for change

- Field instrumentation is not up to the challenge
- Only temperature, pH, dissolved oxygen and conductivity are routinely measured in the field
- Very few results available in the field
- Need to co-ordinate development

5. The Water Framework Directive

- Most significant new European water legislation for decades
- Improve inland and coastal waters and protect them, especially from diffuse pollution in urban and rural areas
- Create better habitats for wildlife that lives in and around water

6. The Water Framework Directive

- Ecological status given new importance
- River Basin Management Plans
- Risk based approach to monitoring



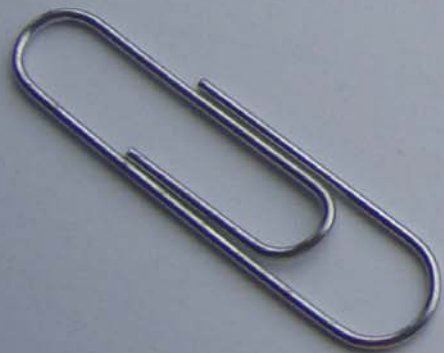
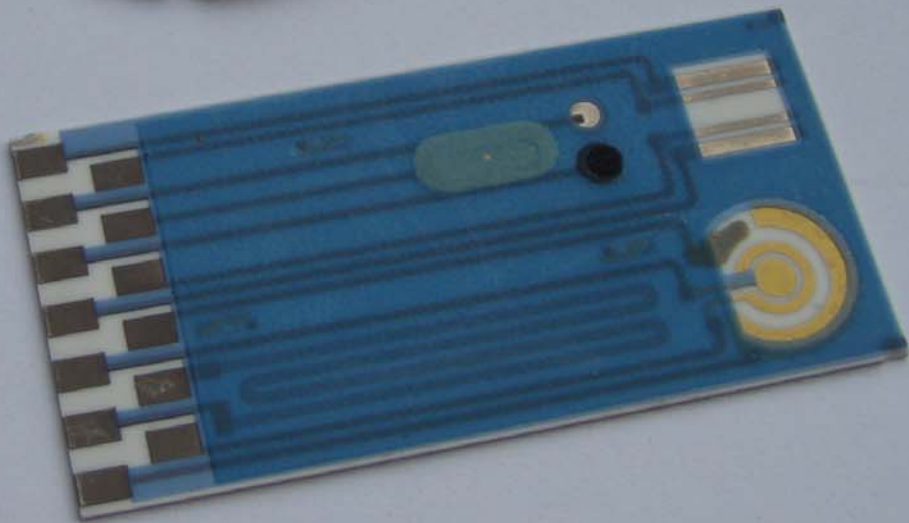
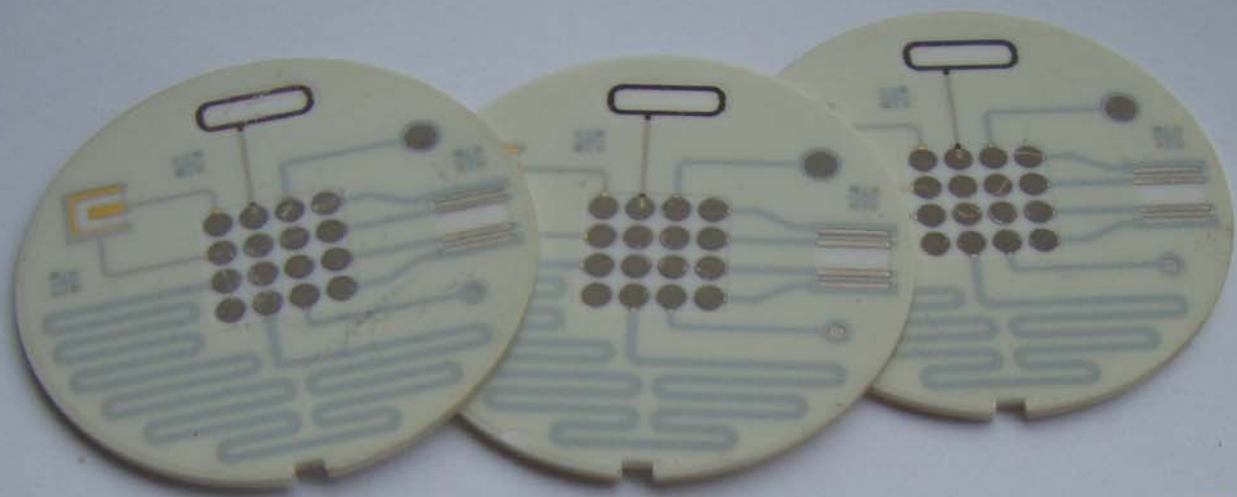
6. Opportunities for bio-sensors

- Hand-held sensor systems are a priority
- Chemical parameters
- Ecological status indicators
- Screening tools



7. Requirements of bio-sensors

- Physically portable, battery powered, robust
- Suites of parameters, speed of analysis
- Ease of use, limits of detection
- Common instrument platform – capable of multiple techniques



8. Enzyme based ammonia bio-sensor

- One-shot ammonia 'dipstick' sensor and instrument
- Achieved required performance in laboratory tests
- Operational trials were not successful
- Single parameter not cost effective.



9. Combined nutrient bio-sensor

- Pursuing the benefits that a multi-parameter sensor promises
- Lower risk to go with Studentship approach
- Once chemistry proven, will then need to develop field instrument

10. EcoAlert EcoBox

- An assay using bacteria
- Toxicity test / risk assessment
- Sensitive, low-cost, rapid response
- Perhaps a role under WFD
- Result not currently available in the field



11. Challenges facing uptake

- Need to make immediate impact on Operational efficiency
- Target suites of chemical determinands
- Sensitivity, robustness, stability and cost
- Need to de-mystify bio sensing techniques
- WFD should open up new opportunities

12. Conclusions

- Need for a success story
- Need to de-mystify 'bio-sensors'
- Co-ordinated development approach
- Water Framework Directive 'Ecological Status'

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