

Early Warning Pollution Detection Device For Application In Water Quality



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Introduction

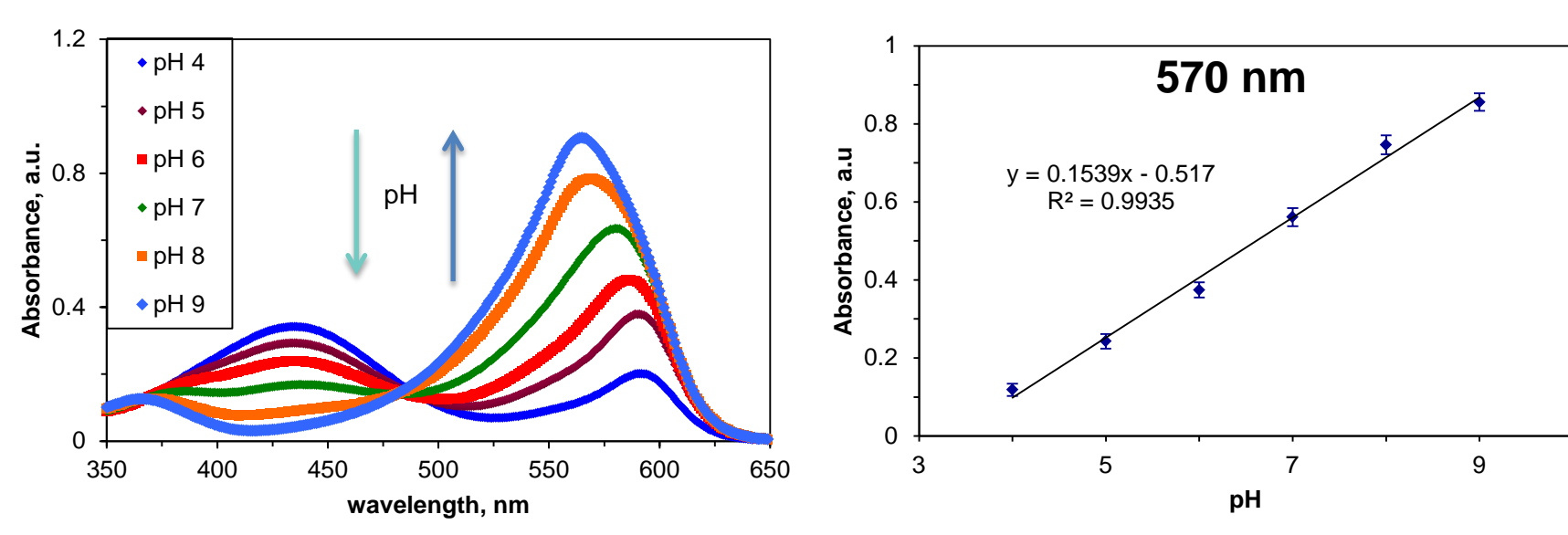
Due to a growing need to protect water resources from contamination, there is a requirement for the development of more reliable and cost effective devices for water quality monitoring. The aim of the AQUAWARN project is to develop and deploy a fully autonomous water quality monitoring device that can measure nitrite, nitrate, phosphate and pH colorimetrically in fresh water and wastewater, and communicate the information to stakeholders in real time.

Table 1. List of analytes, method of detection and range studied

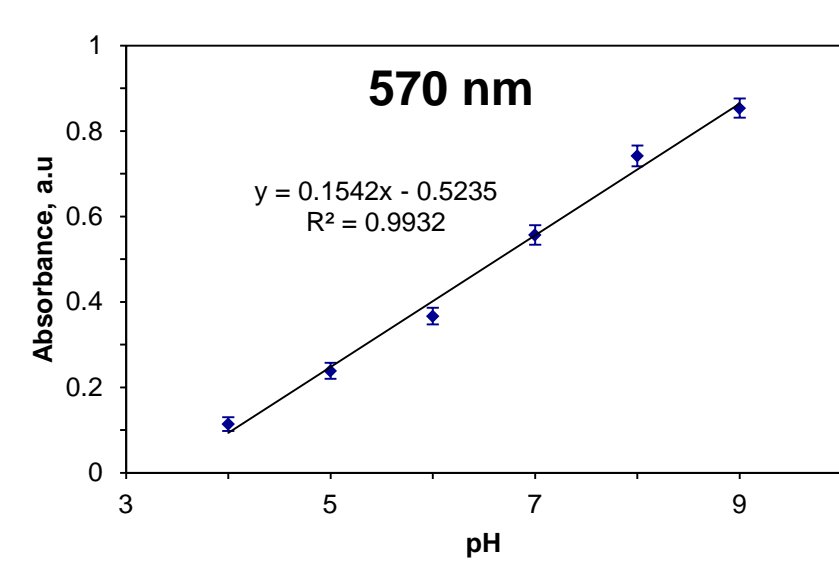
Analyte	Method	Range	Detection Limit
Phosphate	Vanadomolybdate method	0.1-300 µM	0.1 µM
pH	Mixture of dyes	4-9 pH units	n/a
Nitrite	Griess method	0.25-350 µM	0.02 µM
Nitrate	Cd reduction followed by Griess method	0.25-350 µM	0.025 µM

Spectrophotometer

pH

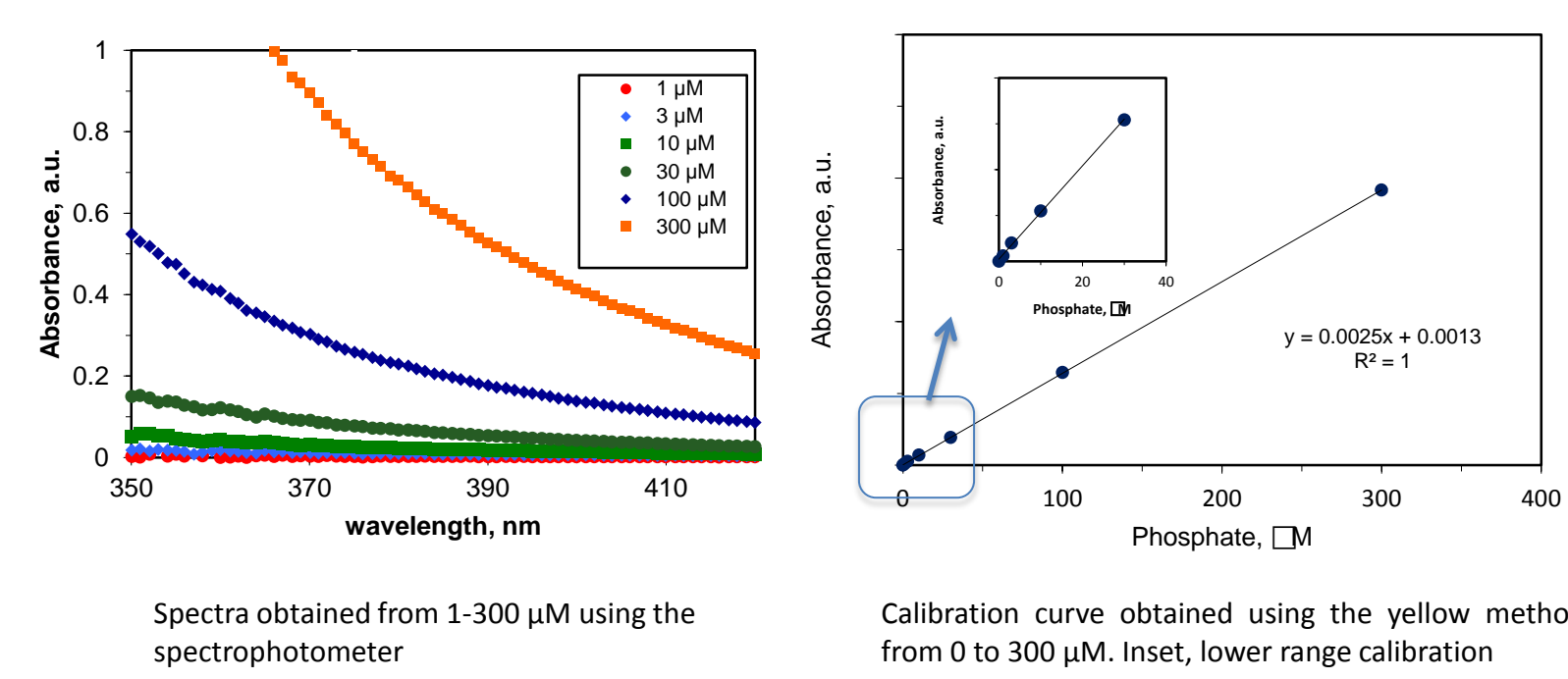


Stability: 5 months (May – September, 2014)

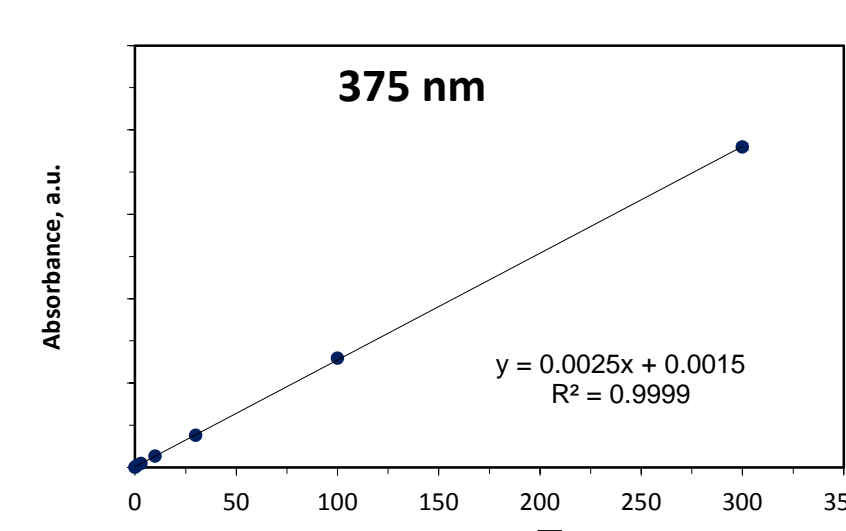


pH	Å	s	RSD (%)
4	0.1142	0.016	12.9171
5	0.2388	0.019	7.8898
6	0.3667	0.0193	5.2734
7	0.5668	0.0230	4.1317
8	0.7418	0.0244	3.2944
9	0.8536	0.0227	2.6655

Phosphate

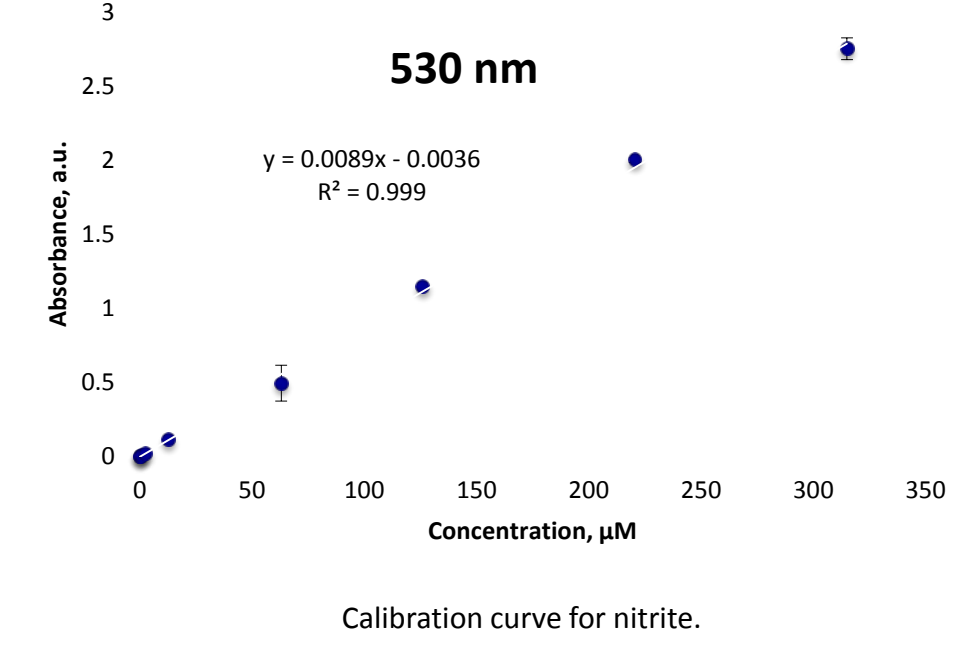
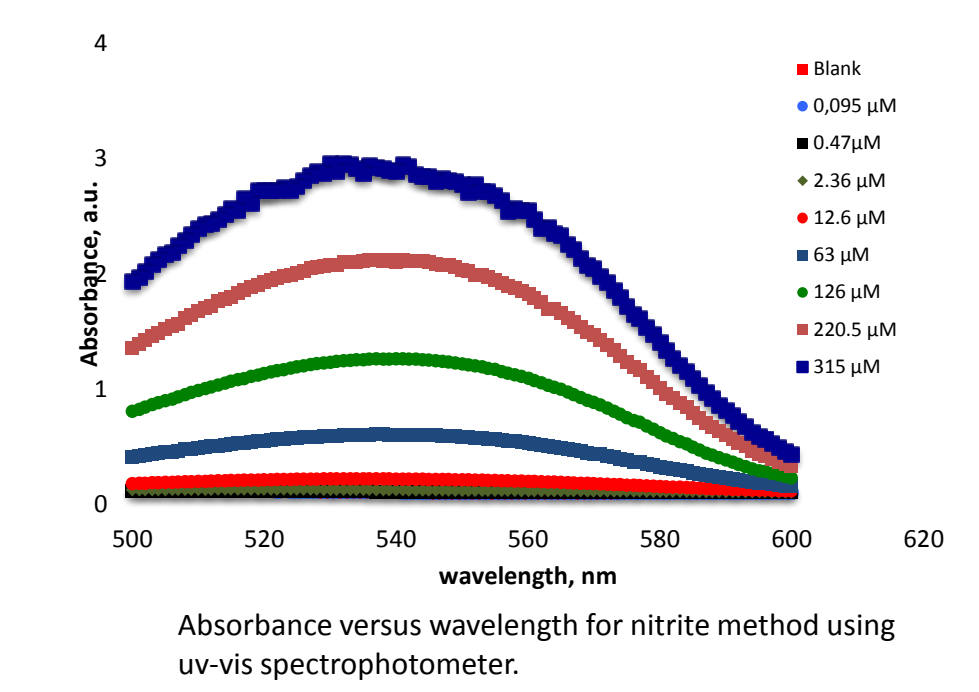


Stability: 8 months (February – September, 2014)

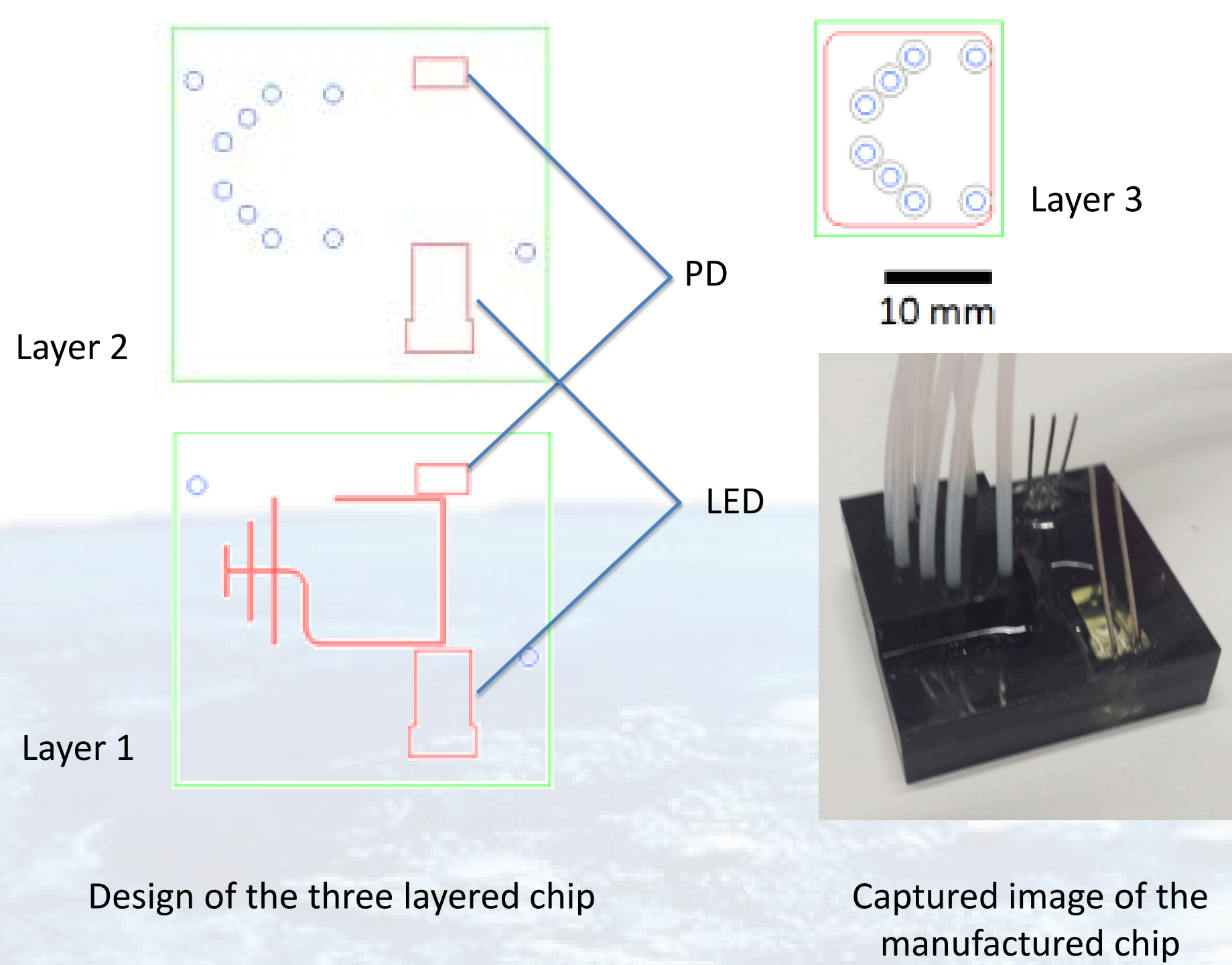


Historical calibration linear fit
 $R^2 = 0.99989 - 0.99998$

Nitrite

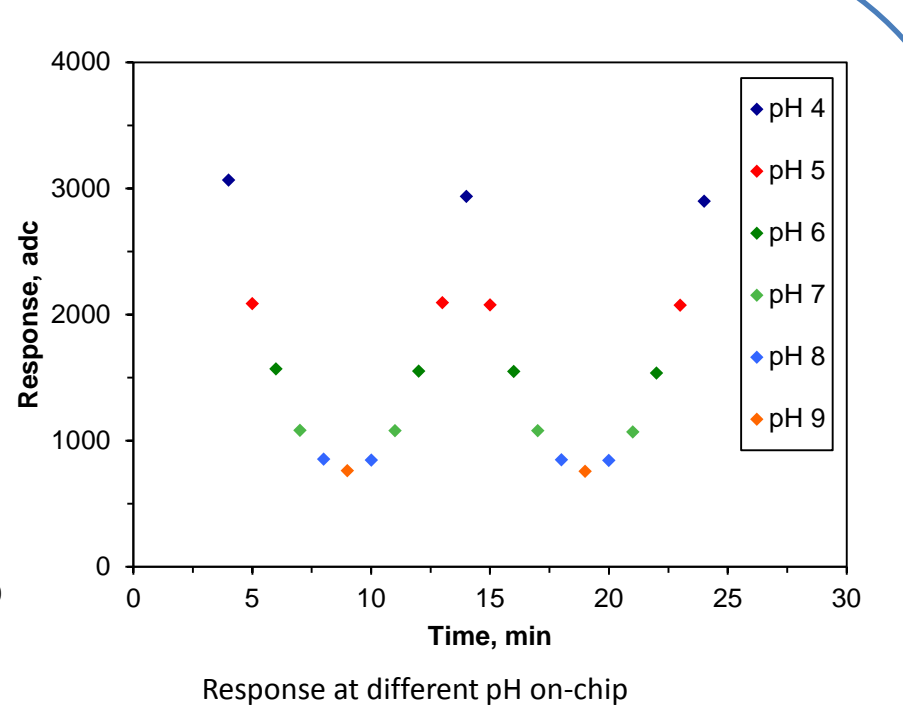
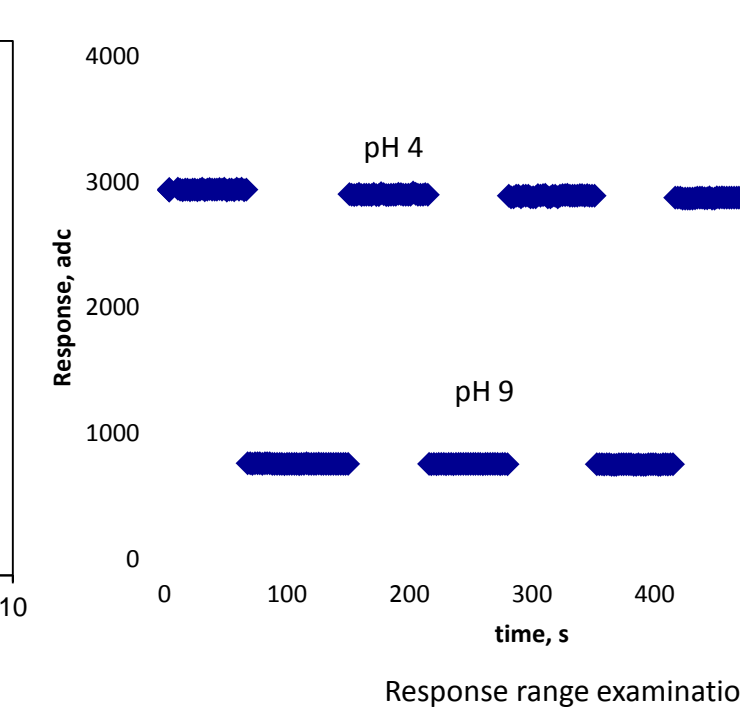
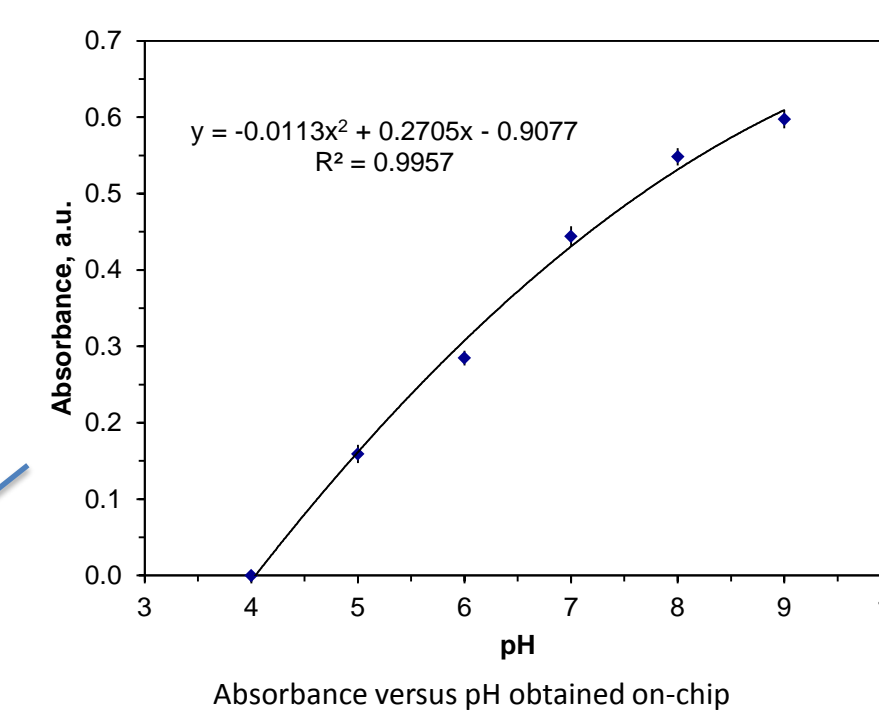


Microfluidics

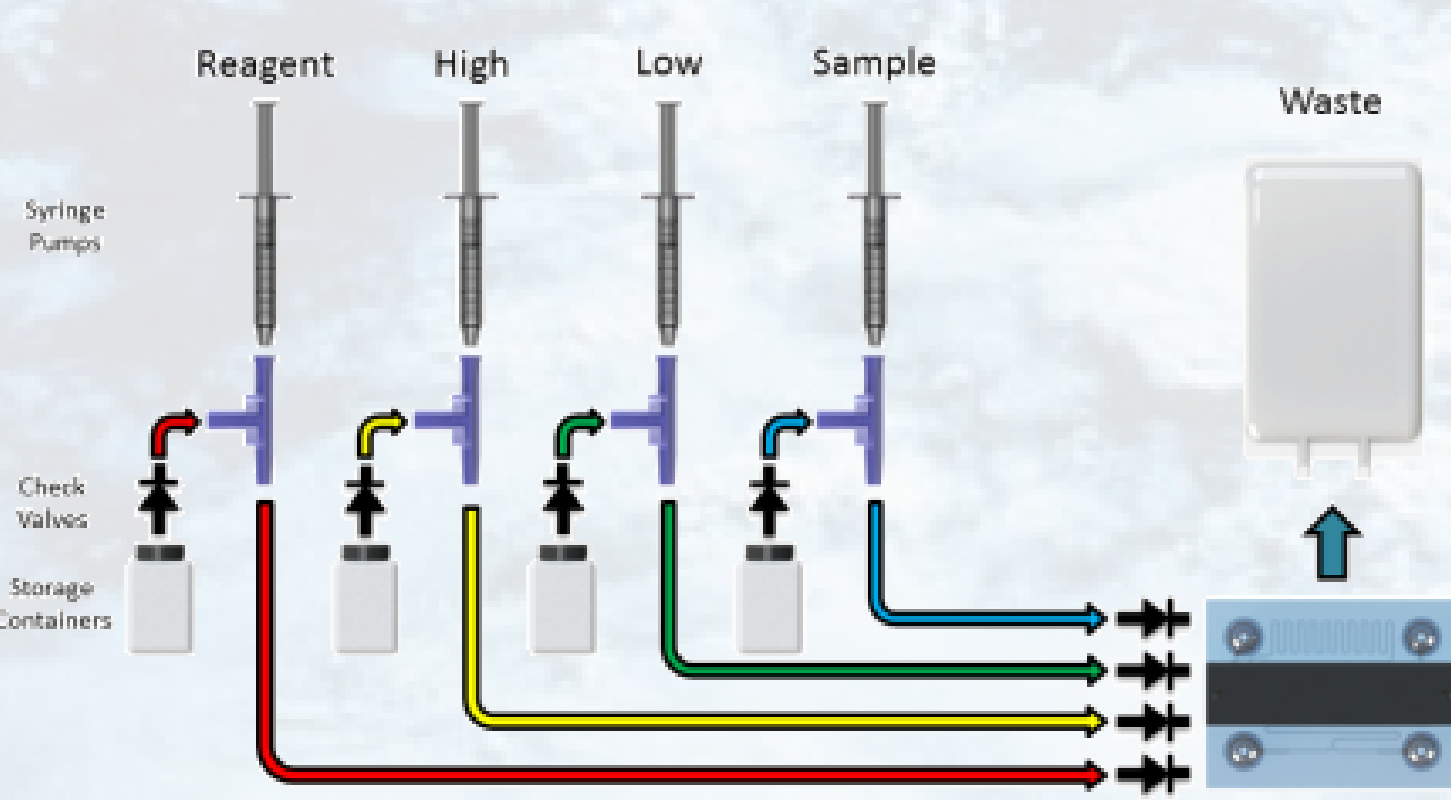


570 nm LED
pH determination

375 nm LED
Phosphate determination

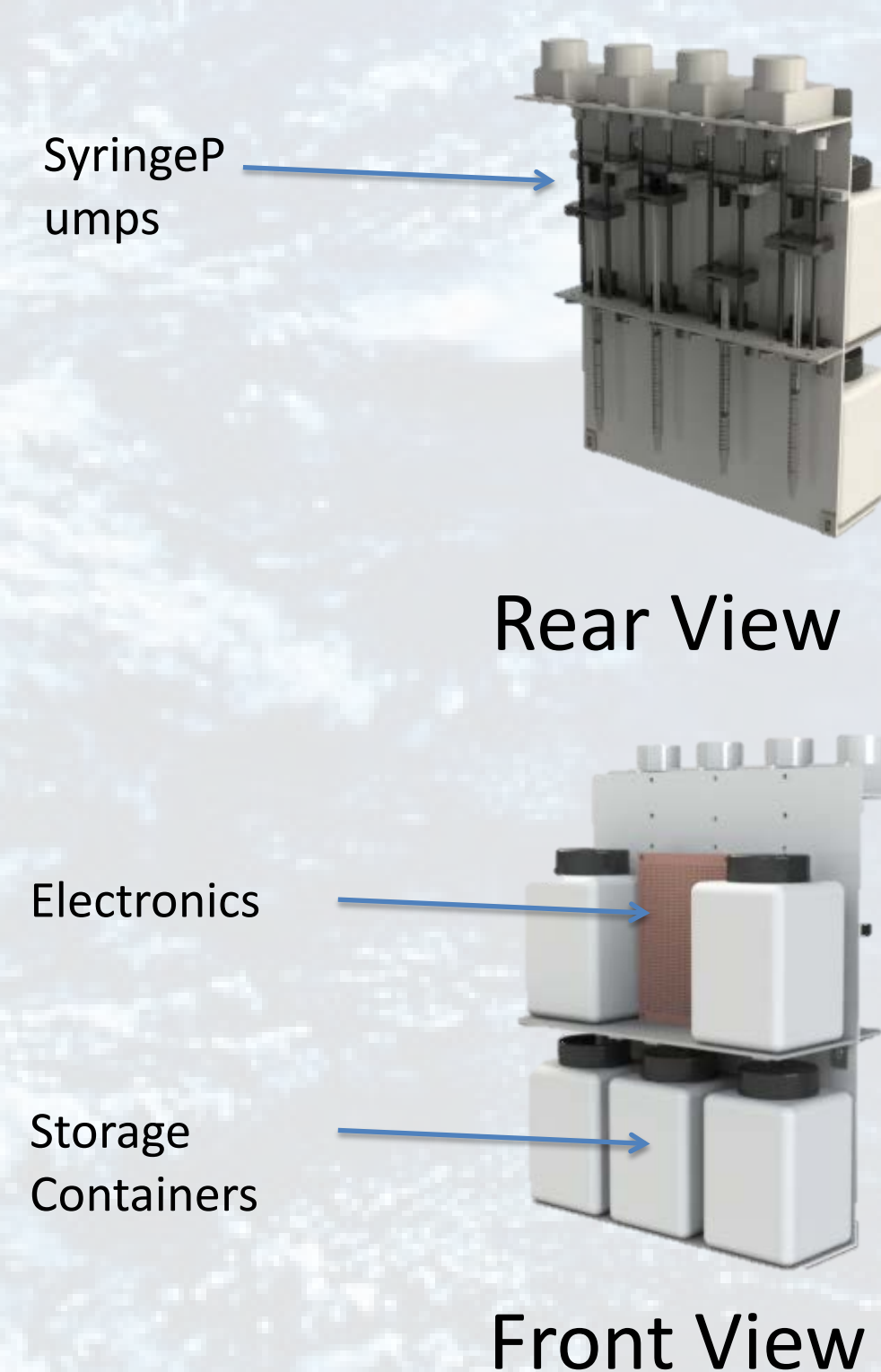


Fluid Handling



- Check Valves
- Minimisation Dead Volume
- Longer Lifetime
- Chemical Compatibility

Packaging



Deployable Prototype



Future Work

- Nitrate studies (uv-vis and on chip)
- Nitrite on chip
- Assessment and validation of the performance of the integrated systems under field conditions

Acknowledgements

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