

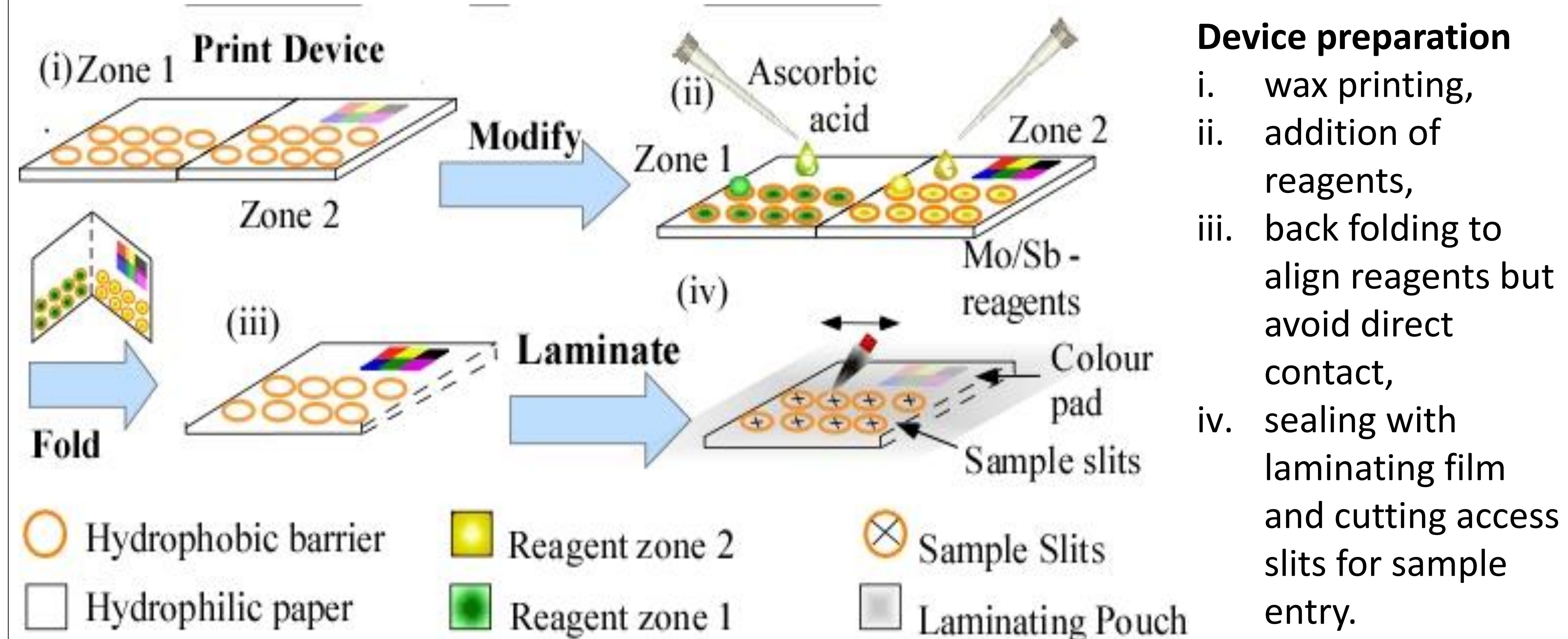
DETECTION OF PHOSPHATES, BY A LAY PERSON, FOR ENVIRONMENTAL ANALYSIS OF RIVER WATER USING A PAPER-BASED DEVICE

Samantha Richardson,¹ Alexander Iles,¹ Jeanette M. Rotchell,² Mark Lorch¹ and Nicole Pamme¹

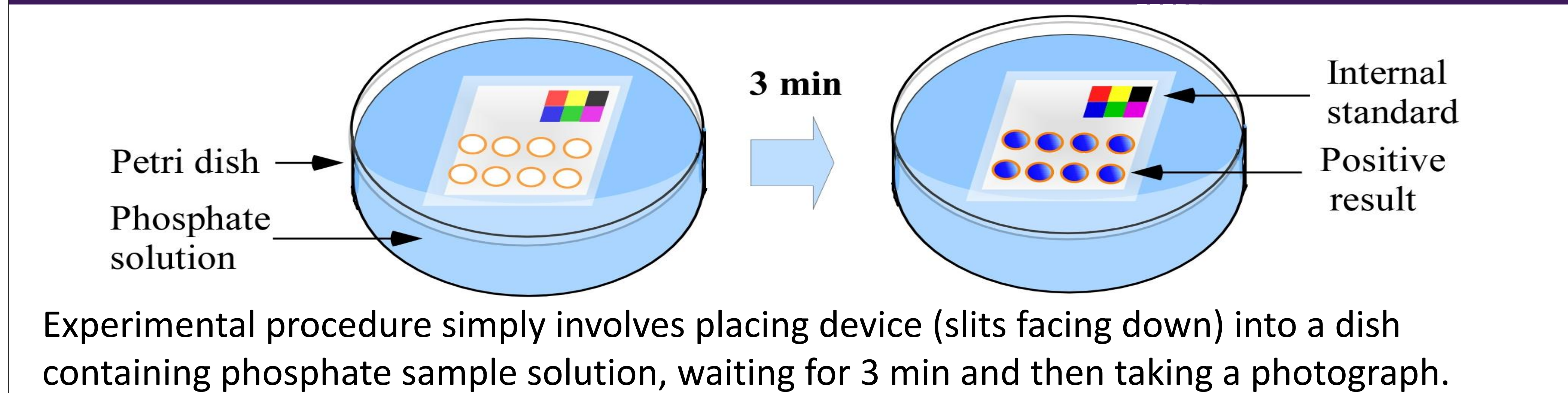
¹ School of Mathematics and Physical Sciences, ² School of Environmental Sciences, University of Hull, HU6 7RX, UK

We describe a simple paper-based microfluidic device for the determination of orthophosphate concentrations in river water. Phosphates enter waterways from field runoff. High phosphate concentrations can promote excessive algal growth, which can lead to eutrophication. An emphasis towards an easy to use device, for a volunteer sampling campaign, lead to the development of a paper-based dip test with circular wax printed reaction zones and pre-deposited reagents. To perform the experiment and record the result, no more than a liquid container, the paper microfluidic device and a smart phone are required. The test takes 3 min, short enough for a volunteer-based activity. Low ppm range phosphate concentrations can be captured using a smart phone camera and then analysed using ImageJ software.

Methodology



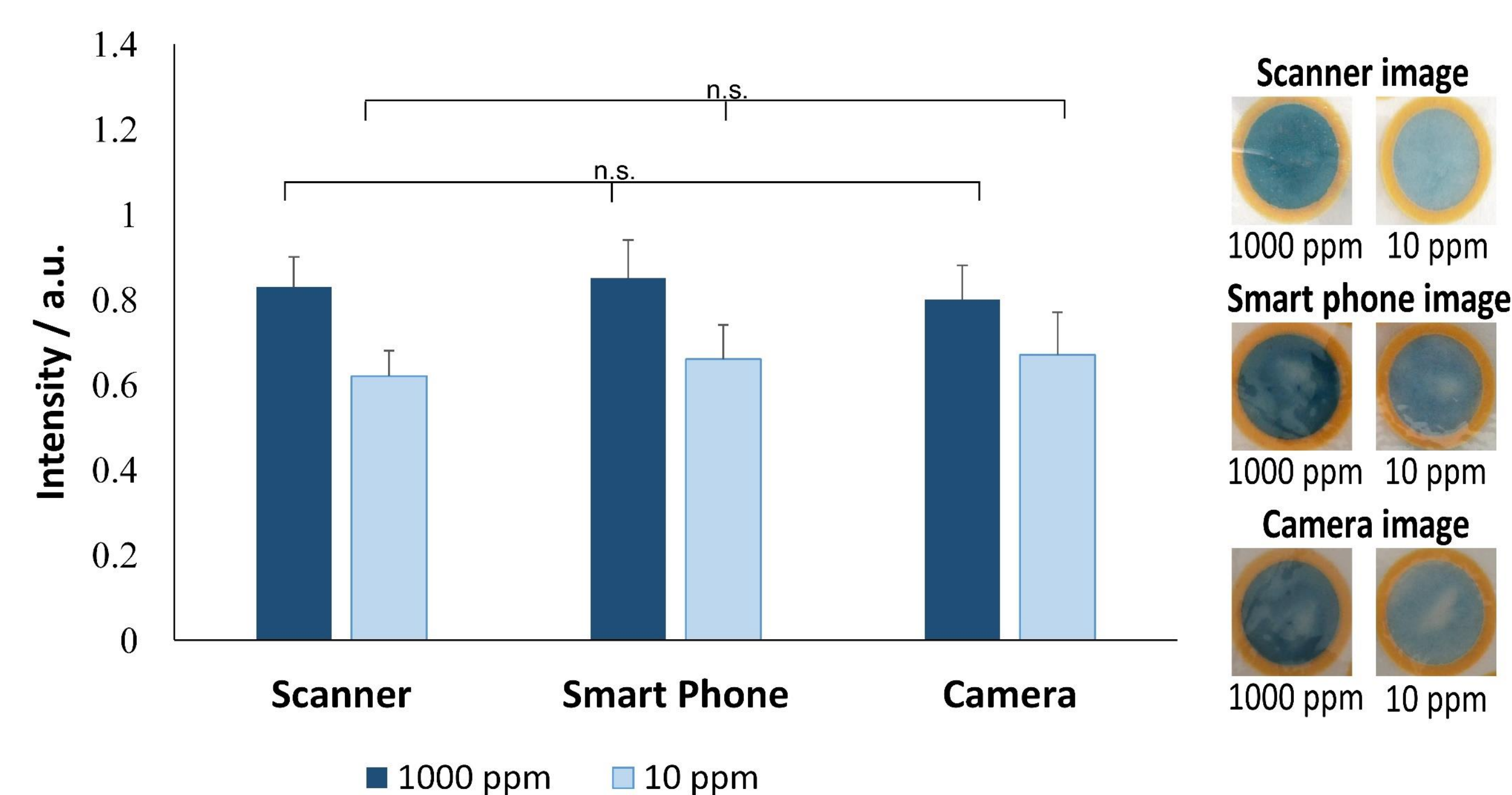
Workflow



Conclusions

- Demonstrated simple and fast paper-based test for analysis of phosphate in water by adapting phosphomolybdenum blue method.^[3-4] Aggressive sulfuric acid (6 M) replaced by p-toluene-sulfonic acid (2 M). Reagents spatially separated via back-folding to allow for two sequential reaction steps.
- User only required to place device into a sample dish, sample enters unaided through narrow slits. User takes photograph after 3 min, suitable for analysis in the field.
- Future work will include addition of further analytes and a dedicated app for users to report data.

Testing with Lay-persons at Outreach Event



Members of public placed two devices into phosphate solutions. Photos were taken after 3 min using either a smart phone or camera. Scanner reading taken independently in laboratory.

- Choice of capture method on value for blue intensity is not significant.
- Smartphone images suitable for semi-quantitative reading of phosphate concentrations.

Time vs Colour Intensity

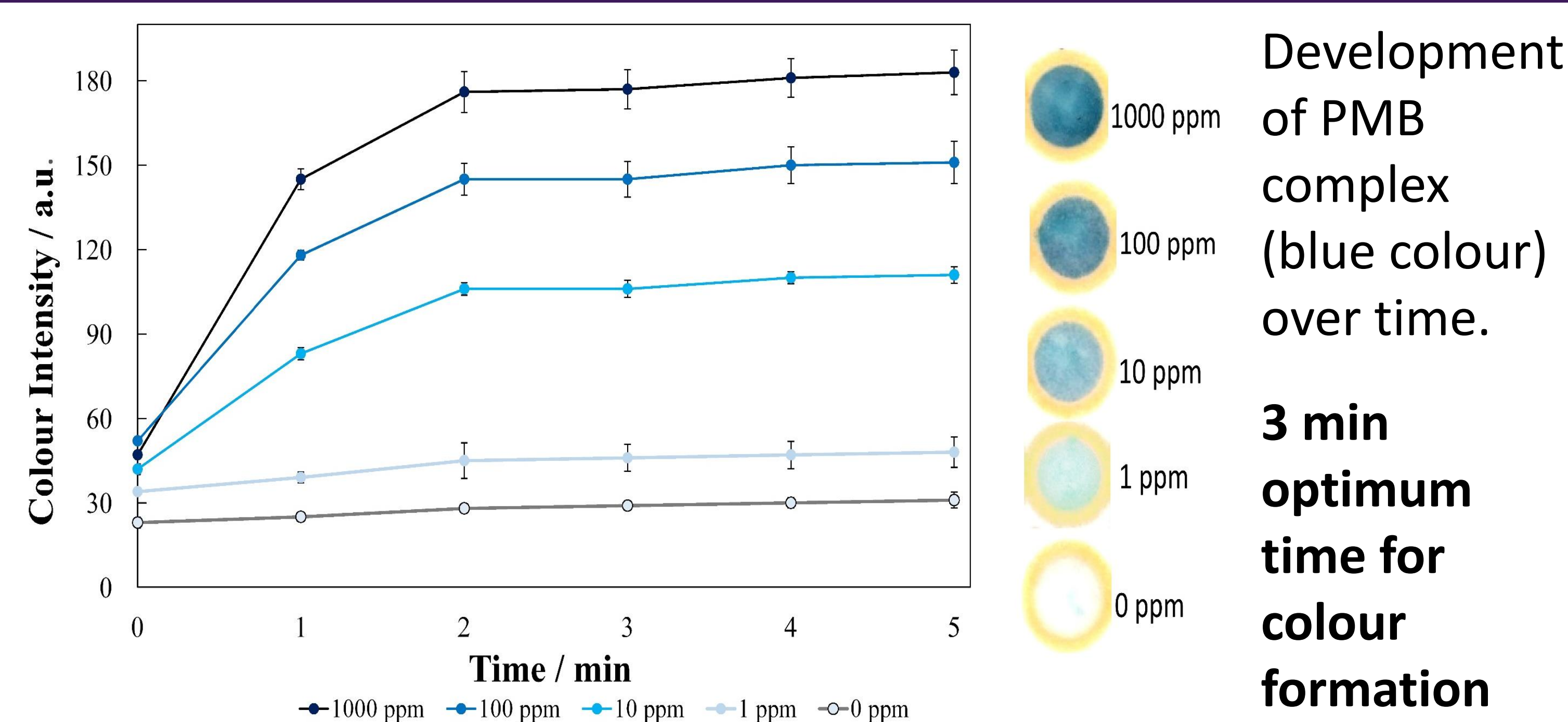
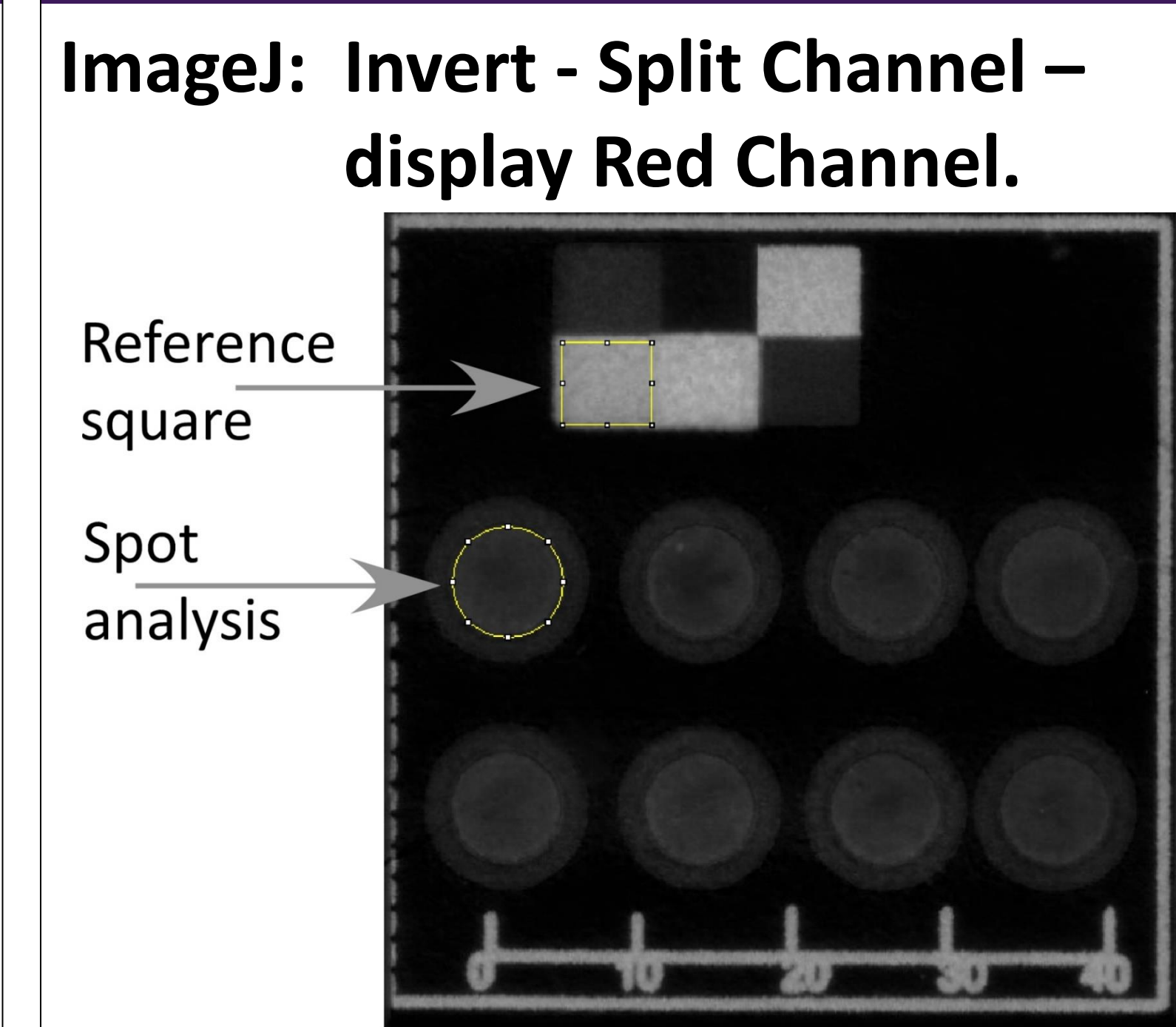


Image Analysis



References

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Acknowledgements

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