Green Gown Awards 2014

AWARDING SUSTAINABILITY EXCELLENCE FOR 10 YEARS

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10 YEAR ANNIVERSARY

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finalist's case study

Queen's University, Belfast

Research and Development

Saving millions of lives by enhancing the solar disinfection of water (SODIS)

Queen's University Belfast

Profile

- HEI
- 17,000 students (includes full and part time students)
- 3000 staff
- Urban

Category supported by

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Section 1 About the project

Summary

Saving millions of lives by enhancing the solar disinfection of water (SODIS): 35% of the global population only has access to microbially contaminated water. SODIS cheaply and efficiently disinfects water but, to be effective, it needs an indicator to show that the water has received a sufficient dose of solar UV light. This project is about developing such an indicator.

Project partners

Invest Northern Ireland provided £69959 for a 9 month project (01/10/12-30/06/13), for materials, IP, travel, overheads, and for a post-doctoral researcher and Professor within the School of Chemistry and Chemical Engineering, Queens University Belfast.

We were the sole receivers of funding but collaborated with Matthias Saladin (Eawag), and Prof Manzano (University of Cadiz), who provided an independent assessment of the success of our indicator technology under relevant SODIS conditions of solar UV light.

Section 2

The problem

1.8 million children die each year as a result of diarrhoea, contracted through drinking microbially compromised water. The SODIS method of disinfecting water, utilising plastic bottles filled with initially microbially contaminated water and subsequently exposed to UV light from the sun for about 6 hours, is making a significant impact on these numbers. This simple process is effective in destroying disease-causing pathogens, but the time taken for total disinfection is dependent on the UV-intensity of the sun, and there is no visual way of telling when that point in time is reached. Hence, to ensure the effective use of SODIS throughout the developing nations, a simple, inexpensive, colour-changing, disposable or reusable indicator for attaching to each SODIS bottle will transform the use of SODIS in the third world and save millions of lives.

The approach

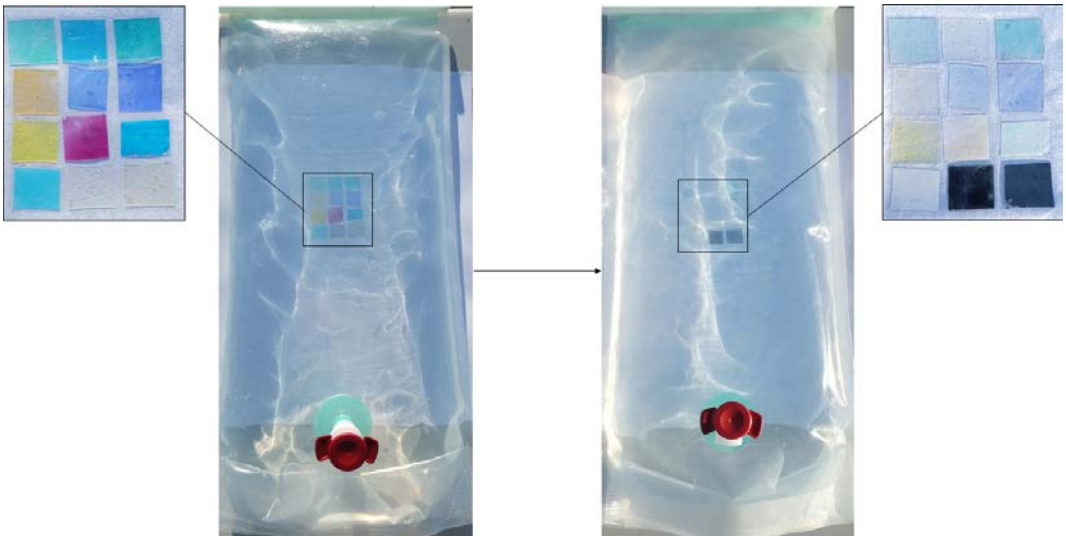
We successfully developed three different methods of visually measuring UV dose as part of this project. All methods achieved a distinct colour change from colourless (or coloured) to coloured (or colourless)

upon receipt of the UV-dose required for complete microbial disinfection. The colour changes can be measured quantitatively in the lab but are sufficiently striking and so clearly discernible to the untrained eye, i.e. the end user.

Initial testing utilised a solar simulator and further work, testing the indicators under real conditions with microbially contaminated water, was carried out in a region of high solar light alongside a SODIS programme to develop more effective plastic bottles (University of Cadiz, Spain).

The highly effective colour change of 12 indicators (of 3 types) during SODIS treatment:

BEFORE SODIS TREATMENT AFTER SODIS TREATMENT



Our goals

Over 5.8 million people in about 30 countries utilise the SODIS method, but without any UV indicator technology to ensure 100% success. The technology we have developed will aid established users and enhance the uptake of the SODIS method by the 748 million people that still rely on unimproved water supplies, significantly improving their quality of lives.

Our UV dosimeter labels use inexpensive materials, contributing little extra cost per SODIS bottle (< 0.1 p), making them far cheaper than the currently available, electronic-based technologies. The features of low cost and a striking colour change, which we have achieved, are essential for their successful utilisation in the well-established and growing SODIS technology programme operating in developing countries. The key benefits are the simplicity, ease of use and inexpensive nature of the technology and the ability to improve the lives of millions overnight.

Obstacles and solutions

Keeping the cost down	We only purchased low cost materials so as not to develop any indicators which would add greatly to the cost of the SODIS method.
Developing waterproof indicators	We investigated non-water soluble polymers and waterproof coverings for our indicators so that the indicators were durable when in close proximity to water.
Developing food-safe indicators	All materials purchased for trials were food-safe, as the indicators will be in close proximity to drinking water.
Lack of high intensity sunlight in the UK	Through collaboration we were able to test our indicators in Spain, in parallel with SODIS water disinfection trials. Giving us real-sun conditions for testing as well as an independent assessment of their reliability when used alongside the SODIS method.

Performance and results

With the SODIS team wishing to move to commercialisation this puts the University in an excellent position for intellectual property development and delivering a high humanitarian impact project. The planned further funding of our project will benefit the University financially. Furthermore, our collaboration with the SODIS team gives our University a great deal of positive exposure.

The project aimed to develop a method of visually measuring solar water disinfection, and we successfully developed *three* novel methods, one of which has the capability of being reusable, an additional desired feature. The project was so successful that the SODIS team are now looking to move this proof of principal project into a commercialisation phase.

Section 3 The future

Lessons learned

Throughout this project, we have strived towards a range of easy to use, inexpensive indicators, and we have learnt lessons on the importance of using low cost materials to make indicators whose production can be easily scaled-up, keeping cost down and ensuring our product is fit for purpose. We have also learned the power of collaboration – the independent assessment of our indicators which emerged from our collaboration was vital to highlight the success of our indicators.

Sharing our project

We are already working with the research group at the University of Cadiz in our trials and have recently submitted a paper providing full details of the technology and the results of the trials conducted so far. Further promotion of the technology will be achieved: through conference and seminar talks and, more importantly, engagement with potentially collaborating/licensing companies, such as Insignia Technologies Ltd.

What has it meant to your institution to be a Green Gown Award finalist?

QUB has a strong commitment to improving the lives of others through its efforts. QUB recognizes that the business case for this technology is not strong, but continues to support it and its eventual commercialization unreservedly because the humanitarian case is overwhelmingly persuasive and a vital feature of the University's ethos to bring benefit to humankind. Being a Green Gown Award finalist enhances this support with the knowledge that others recognize the benefits of what we are doing.

Further information

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