WATERWORKS 2017 RDI FUNDED PROJECTS BOOKLET

Project: Sense and Purify - Detect, Destroy and Remove Water Contaminants

Acronym: Spy

Outcomes and expected impact:

Our ultimate objective is to see the SPy technology commercialised and widely deployed in a range of industries. For some applications, e.g., pharmaceutical production streams, it is likely to be the only treatment needed while others, e.g., food waste, may require additional bioprocessing. To move the technology towards commercialisation, significant additional investment will be required that will initially be sought through Angel and then Venture Capital investors with a view to either spinning out a manufacturing company or establishing a distribution deal with one of the major distributors.

This programme directly addresses UN SDG Goal 6: Ensure access to water and sanitation for all. The innovative Sense and Purify programme will create a custom reactor with integrated electrochemical sensors that is suitable for the local production of clean water for industry or drinking at low capital and operating cost. To enhance innovation capacity and integration of new knowledge prototype reactors will be demonstrated for the treatment of production wastewaters from the food (NU) as well as pharmaceutical industries (DCU). Moreover, because of the oxidising power of the hydroxyl radicals produced, the technology will find fruitful application in the environmental remediation of brown field sites since the feeder electrodes generating the electric field could be inserted into contaminated soil and the organic pollutants, e.g., fuel oil, PAHs etc. destroyed. The expertise of the team are high complementary with each partner having distinct, autonomous tasks that link directly to the overall objective. The mid-term benefits include the translation of basic research into practical application, e.g., the metal complexes into sensors, new bilateral partnerships, trained researchers and significant dissemination and communication of the project. Longer term, the team plan to leverage this investment and work together to commercialise the technology most likely through a distribution deal with a major supplier or a spin-out company.

List of deliverables expected:

Scientific:

- Novel wireless electrochemical approach to oxidative electrocatalysis.
- Insights into the rates and mechanism of organic pollutant oxidation.
- Novel sensors for rapid and sensitive assessment of water quality.

Economic

- Integrated sense and purify reactor with decreased wastewater treatment costs.
- Enhanced removal of recalcitrant organic pollutants from industrial wastewater streams.

Social

- Enhanced public awareness of water resource issues.

Education and Outreach. •Researchers with the necessary multidisciplinary skills for future industrial, policy, academic and start-up employment.	
Expected research results to communicate and disseminate (in very general terms)	**Target groups for communication and dissemination activities:**
1. **Publications** Optimisation of boron doped diamond for hydroxyl radical production, decomposition of organic pollutants and mineralisation of impurities. >5 publications in major scientific journals.	Scientific Peers
2. **Presentations** at major international conferences.	Scientific Peers
3. **Web site.** To help general public and policy-makers understand the importance water treatment by AOP and its role in an integrated WWT, energy and CO2 reduction strategy	General public, policy makers.
4. **Outreach.** To engage school children with science and technology as well as environmental protection.	School children.
(*add more lines if needed)*	
Case studies. DCU will apply the SPy technology to waste water samples from the pharmaceutical industry in Ireland while Nantes University will test on food production waste waters.	
Water Policy context / project contribution to policies (National, European, International – UN SDGs): This programme directly addresses UN SDG Goal 6: Ensure access to water and sanitation for all. The innovative Sense and Purify programme will create a custom reactor with integrated electrochemical sensors that is suitable for the local production of clean water for industry or drinking at low capital and operating cost. To enhance innovation capacity and integration of new knowledge prototype reactors will be demonstrated for the treatment of production wastewaters from the food as well as pharmaceutical industries. Moreover, we believe that the technology could ultimately find fruitful application in the environmental remediation of brown field sites since the feeder electrodes generating the electric field could be inserted into contaminated soil and the organic pollutants, e.g., fuel oil, PAHs etc. destroyed.	