

Environmental Research, Technology Demonstration and Conference Project

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| ECF Project: | ECF 2021-84 |
| Project Title: | Engineering a microbial biosensor for monitoring microplastics pollution |
| Principal Investigator: | Dr Chua Song Lin, Department of Applied Biology and Chemical Technology, The Hong Kong Polytechnic University |
| Total Approved Grant: | \$499,000 |
| Duration: | 1/8/2022 to 31/1/2025 |
| Project Status/Remarks: | On-going |
| Project Scope: | <p>The inability to remove plastics after waste disposal leads to pollution in PI's natural environment. Microplastics enter water bodies, thereby endangering aquatic life and subsequently human health after consumption of seafood. Whereas large plastics are easier to detect and remove, microplastics from cosmetics or degraded fragments are poorly detected. After microplastics isolation, most detection techniques include visual inspection via microscopy or chemical characterization (FTIR or Raman spectroscopy). However, there is no biological-based techniques for microplastics detection currently. As biological methods are highly sensitive at low pollutant concentrations, it is imperative to develop cheap, sensitive and accurate biological techniques that detect microplastics.</p> <p>Here, the project team aim to engineer an environmental bacterium, <i>Pseudomonas aeruginosa</i>, as a biosensor that binds to microplastics and produces detectable fluorescent signals within hours. The project team previously showed that bacteria could activate <i>cdrA</i> gene upon microplastics colonization, rationalizing the development of GFP biosensor tuned to <i>cdrA</i> expression. The project team expect to deploy it for high-throughput, rapid, low-cost and easy-to-operate detection of low concentrations of microplastics from environmental samples. Screened samples of interest can be further analyzed by Raman spectroscopy, thereby reducing cost and operation time. The project team's proposed project serves as proof-of-concept that microbial biosensors can be used to detect microplastic pollution.</p> |
| Summary of the Findings/Outcomes: | To be available upon completion of the project |