Imperial College London

DEPARTMENT OF EARTH SCIENCE AND ENGINEERING

Forensic Detection of Microplastics

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Microplastics are very small pieces of plastic that pollute the environment. They have a number of sources ranging from cosmetics, clothing, and industrial processes. Microplastics are particularly prevalent in aquatic and marine ecosystems. Microplastics degrade slowly on timescales of centuries to millennia. Their prevalent and persistent nature means that microplastics are likely to be ingested by marine organisms. Once in marine organisms microplastics can be retained in tissues and enter the food chain.

For the problem of microplastic pollution to be solved the sources of these materials must be determined. Establishing provenance is not easy when the materials are microscopic in nature. Fortunately, microplastics have tell-tale chemical fingerprints of their origin that can be recognised using modern analytical chemistry techniques.

Stable carbon isotope ratios allow the recognition of life when organic structures have become difficult to interpret. Stable isotope ratio measurements now extend to the level of individual compounds, termed compound specific isotopic analysis (CSIA) providing greater diagnostic capabilities. A next generation method is now available, but currently unapplied. At Imperial College London, stable carbon isotope ratio techniques have now progressed from individual compounds (CSIA) to individual carbon atoms, to give position specific isotope analysis (PSIA). There are

multitude of potential arrangements of carbon isotopes in hydrocarbons with five carbon atoms or less. These arrangements can be used as unique geochemical signatures to identify the sources of organic compounds. The PSIA method is a system recently developed in the Organic Geochemistry Laboratories. Few of these systems exist globally and the application of this system to microplastic forensics is unprecedented.

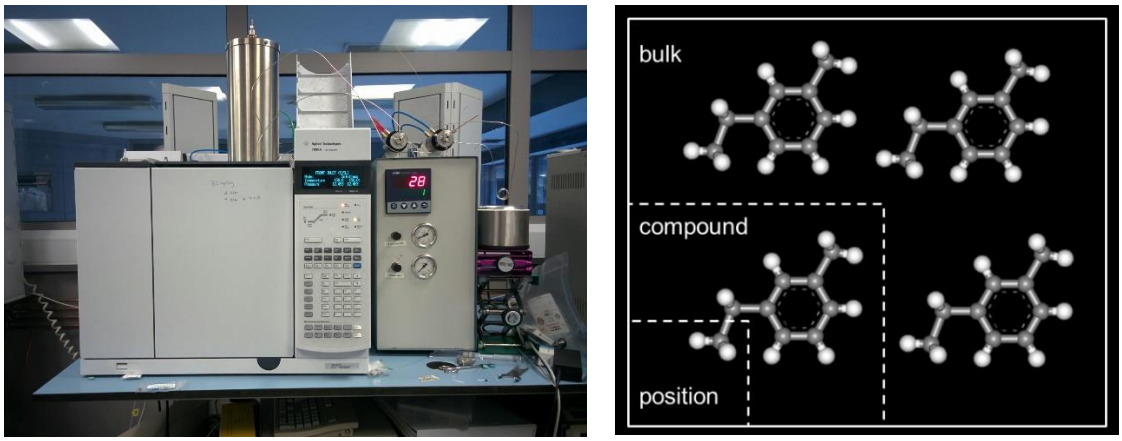

Figure 1. The PSIA system at Imperial College London (left panel) and the increased resolution provided by compound specific isotope analysis, or "CSIA" and the ultimate resolution provided by position specific isotope analysis, or "PSIA" (right panel).

The research will use equipment in the Imperial College Organic Geochemistry Laboratories. Full training will be provided. The project would suit a candidate with a background in Earth Science, Chemistry or a subject that develops similar skills.

- For more information contact: Professor Mark Sephton (m.a.sephton@imperial.ac.uk).
- Details of how to apply are at: https://www.imperial.ac.uk/study/pg/apply/how-to-apply/.
- Funding details can be found at: https://www.imperial.ac.uk/study/pg/fees-and-funding/scholarships/.