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Editorial

Microplastics analysis

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Microplastics (MPs) were identified as one of the major environmental threats. The work plastic comes form the Greek term plastikos, which means that it can remain shaped in various systems. Global plastic production did hit approximately 348 million tonnes in 2017, being China the largest producer responsible of 27% of worlwide pollution. It is estimated that more than 8300 million tonnes of virgin plastic have been produced to date. MPs are directly released into the water or formed by degradation of bigger plastics. In short, annually between 4 and 12 millions of tonnes of plastics are going into the oceans and most probably in 2050 will exceed the amount of fish The rest of the plastic, between 22–43%, ends up as landfills, causing the soil lose its fertility. Most of the plastic wastes are non biodegradable and can take up to 500 years to decompose.

Many consumers are not aware that plastic goods are usually made in petrochemical plants. According to the 2019 Centre for International Environmental Law Report, its production will contribute approximately to 850 million tons greenhouse emissions. Plastic is part of our daily life and worldwide we use 4 trillion plastic bags annually and 1 million plastic bottles every minute.

MPs, are made from diverse molecules and correspond to diverse product types. MPs are composed of diverse suite of polymer type, being the most produced and consumed ones polypropylene (PP), low density polyethylene (LDPE), high density polyethylene (HDPE), polyvinyl chloride (PVC), polyurethane, polyethylene terephthalate (PET) and polystyrene (PS) are diverse and come from a multitude of sources, also they are in different sizes, colours, shapes and types of materials.

MPs pollution is nowadays a global and ubiquitous problem being detected everywhere: marine environment, sand beaches, wastewaters, surface waters, soils, sludges, sediments, biota, food and air. MPs contain additives, i.e. phthalates and they can be as well a vector of organic contaminants and pathogens that can be ingested by organisms and introduced into the food web. Airborne fibrous MPs may enter our respiratory system with risk to the environment and humans.

This Special Issue (SI) includes a comprehensive list of research papers describing sampling and analytical methods for determining MPs in a variety of samples. This SI will be of great help to researchers considering that Standard Operational Procedure (SOPs) on sampling and analysis are still missing. Luckily this last year an ISO/NP method for analysing MPs in dinking water and groundwater using vibrational spectroscopy was drafted and hopefully soon will be available.

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Having said that, keep in mind as well that methods used for MPs analysis require the best possible reduction of natural particles whilst preserving the integrity of the targeted synthetic polymer particles.

The topics of the 14 invited papers to this Special issue are as follows:

1. Sediment sampling with an aluminium core sampler instead of plastic tubes to avoid contamination,
2. An effective modification of the Sediment MP Isolation (SMI) unit to avoid PVC contamination
3. Extraction of MPs by density separation using ZnCl2 reuse, the use of the well-known system
4. The use of QuEChERS to extract MPs form a variety of complex matrices such as sediments, soils and sludge.
5. Mapping of MPs fibre mixtures of PE, PP, PA, PVC, PES and PET in sand and algae using a new microFTIR method,
6. Determination of LDPE in sludge using Fenton purification and FTIR identification,
7. New concept of MPs separation with air bubbles followed by FTIR microscopy for the analysis of MPs in sand samples.
8. Validation of an FT-IR microscopy method for the determination of MPs in surface waters
9. Leaching of phthalates form PVC using an infinite sink approach
10. dentification of MPs in wastewaters using cascade filtration and pyrolisis GC–MS
11. Ecological approach of MPs targeting zooplankton, fish eggs, fish larvae as part of the food web in estuarine and coastal waters and the water column
12. Impact of MPs in wildlife using stomach flushing technique to quantify MPs in Crocodilians followed by microscopy and FTIR.
13. Plant uptake by MPs using confocal laser scanning microscope
14. Simplified protocol of passive deposition of atmospheric particles followed by Nile Red and micro-Raman to identify natural and synthetic microfibers and MPs in indoor and outdoor air.

Overall this SI provides useful snapshots of current progress on the analysis of MPs. In short, this SI will serve scientists working in interdisciplinary fields, like chemistry, biology, environmental, marine and soil sciences and beyond. It will help as well to bridge approaches between researchers, the public as well as policy. In this context I would like to add few recommendations developed in Canada already few years ago to mitigate plastic pollution: (i) law and waste management strategies, (ii) education, outreach and awareness, (iii) source identification and (iv) increasing monitoring and further research.

This Methods X SI should be in the radar of all of you, specially for those already experts in the field as well as newcomers and students who want to learn more about sampling and analysis of MPs in the total environment.

Finally as Guest Editor I would like to thank all authors for their excellent contributions, all reviewers for the time and expertise advice and to the Methods X technical support team as well for their valuable help preparing and editing this SI.

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