IN-NOVAPlastics (R2B2019/03)

INNOVAtive tools for the quantification of and micro and nano-Plastics in environmental samples

Worldwide Problem

Plastic is ubiquitous in the environment. Plastic pollution has been addressed as an important threat to biodiversity according to the International Union for Conservation Nature.

Plastics in the environment degrade to smaller particles under the action of various environmental factors. These microplastics (MP) and nanoplastics (NP) are likely to pose a high environmental impact since they are prone to adsorb organic contaminants and pathogens from the surrounding media.

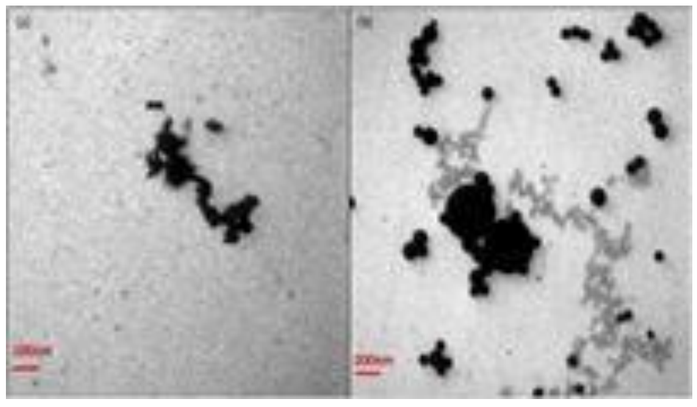

Figure 1: Enlarged microplastic picture

- Each year, Europeans generate 25 million tonnes of plastic waste, but less than 30% is collected for recycling. Worldwide, plastic accounts for 85% of marine debris, and this can be easily understood when taking into account the extensive production of plastics all around the world.
- In the European Union alone, between 150,000 and 500,000 tonnes of plastic waste ends up in the oceans every year, which is a small part of the world's marine litter.
- In total, it is estimated that between 75,000 and 300,000 tonnes of microplastics are released into the environment each year in the EU and can affect human health through the food chain.

In addition, microplastics are also intentionally added to products such as cosmetics, detergents and paints and are dispersed during use or generated when they deteriorate or break down in products such as tyres or synthetic fabrics.

We are still far from knowing all the effects of microplastics on human health and the environment, so more research is needed on these aspects.

Project Outline

Although, literature provides a wide range of analytical techniques for the identification and quantification of M/NPlastics in environmental samples, these methods are difficult to apply as routine analysis and are not standardized. In addition, major limitations of current methodologies are that they are the time consuming, expensive and of low robustness.

We propose an innovative approach, for in situ quantification of M/NPlastics based on Fluorimetric, Plasmoelectric effect and microfluidic counter methods that could be used as routine analysis in Global harmonized monitoring programs.

Objectives

The overall objective of IN-NOVAPlastics project is to provide a new tool, based on innovative techniques recently succesfully used in the area of micro and nano materials (the "Fluorimetric method", the "Plasmoelectric effect" and the"Flow cytometry") for in situ quantification of Nano and MicroPlastics.

Our challenge, is to create a simple and innovative device reasonably priced, reliable, robust and easy to manufacture that could be used in routine analysis in global harmonized monitoring programs. We propose to develop this device based on innovative techniques that have recently been used in other fields of nano materials by reserachers of the workteam.

Involved Techniques

We propose to develop a new device for M/NPlastics determination integrating three new techniques recently usedin the area of micro- and nano- materials:

- The "Fluorimetric method" is one of the most cheap, fast and promising methods for M/NPlastic detection and characterization.
- The "Plasmoelectric effect" consists of an optically induced electrochemical potentials in metallic nanostructures.
- The "Flow cytometry" is a technology that is used to analyze the physical and chemical characteristics of particles in a fluid as it passes through at least one active light element (normally laser light).

This methodology has been used in the medical field for counting and classifying cells according to their morphological characteristics, presence of biomarkers, and in protein engineering.

Project Duration

01/01/2020 - 31/12/2020

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