Title	**Environmental impact of micro and nano plastic litters: identification and analysis by Raman spectroscopy and mass spectrometric techniques**
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Project description:

During the production of plastics, plasticizers are added to enhance the properties of parent polymers. They can be intentionally added substances, such as the constituting monomers and additives used to impart a desired property or function to polymers, and other chemicals not intentionally used, e.g. impurities, reaction by-products, and breakdown products. The subsequent use, disposal, and recycling contributed to their presence in the environment and food chain. Some of these compounds are recognized as potential toxicants toward humans or biota and are actually listed among substances classified by ECHA and REACH regulation as endocrine disruptors, persistent, bioaccumulative, toxic (PBT), or very persistent very bioaccumulative (vPvB). Sensitive, selective and reliable analytical methods are therefore required to monitor the presence of both microplastic and related additives at the ultra-trace concentration levels occurring in a remote environment, with the aim to assess the health risk. Nowadays, InfraRed-based spectroscopies are the most used and widely adopted not-destructive spectroscopic technique to characterize microplastic particles in environmental samples, as through filtered water, soils, or even organisms. The fingerprint signature belonging to each polymer class made this approach performing, but it still suffers by water interference and the difficulties related to particles smaller than few tens of microns. Raman spectroscopy is growing as an alternative to IR, as far as both of them are vibrational techniques, but Raman can be obtained using visible light excitations, that ensure higher focusing resolution (i.e. allowing the analysis of smaller particles) and it is not affected by water. By the other side, mass spectrometry (MS) coupled to gas chromatography (GC) or liquid chromatography (LC) is the cutting-edge technology for the multicomponent determination of organic compounds at the ppb-ppt concentration range. Furthermore, high resolution (HR) MS can ensure a high confidence degree also for the characterization of non-target compounds.

Objectives: spectroscopic technique will be used to identify and characterize nano and microplastics as well as the plastic-related chemicals considered toxic and relevant for the environment and biota.

Publications

1. Jimenez de Aberasturi D., Henriksen-Lacey M., Litti L., Langer J., Liz-Marzán L, 2020. “Using SERS Tags to Image the Three-Dimensional Structure of Complex Cell Models” Advanced Functional Materials https://doi.org/10.1002/adfm.201909655
2. Schymanski, Emma L, Heinz P Singer, Jaroslav Slobodnik, Ildiko M Ipolyi, Peter Oswald, Martin Krauss, Tobias Schulze, et al. 2015. “Non-Target Screening with High-Resolution Mass Spectrometry: Critical Review Using a Collaborative Trial on Water Analysis.” Analytical and Bioanalytical Chemistry 407 (21): 6237–6255.

Collaborations/Network:

Lucio Litti (DiSC), Moreno Meneghetti (DiSC), Fabiana Corami (CNR, Venice), Luca Lucentini and Daniela Mattei (Italian National Health Institute, ISS).

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