Determination and qualitative characterization of microplastics in Ocean Arctic waters

Determination and qualitative characterization of microplastics in Ocean Arctic waters

Silvia Fraterrigo Garofalo, Camilla Galletti, Chiara Novara, and Debora Fino

Dipartimento di Scienza Applicata e Tecnologia (DISAT), Politecnico di Torino, Corso Duca degli Abruzzi 24, 10129-Torino, Italy
E-mail: silvia.fraterrigo@polito.it

One of the most persistent and abundant types of marine pollution is represented by microplastics, small plastic debris less than 5 mm in size. Plastics are cheap, lightweight, strong, durable and corrosion resistant. All these features together arose the investment in plastic manufacture, leading to massive production and application. Therefore, the amount of plastic-based waste sharply increased. When the plastic debris enter the marine environment, they undergo photochemical, mechanical or biological degradation, which cause their division even in smaller pieces. These plastic fragments are so small that they are no longer discernable from the surroundings so that they are easily ingested by marine organisms. Furthermore, the reduced size of these plastic wastes make their transportation via ocean current and wind very simple, even in the most remote areas of the planet [1]. The aim of the present work was to qualitatively characterize the microplastics found in the marine area of the Northwest Passage during the Arctic Expedition conducted by Gyres in 2016. The samples were collected using a Manta trawl and 20 micron pump and successively stored in isopropyl alcohol until analysis. Six water samples were examined: they were first sieved using 5 mm, 2 mm, and 0.3 mm sieves to separate solid material in two different class sizes, 5-2 mm and 2-0.3 mm, respectively. Sieved materials were then dried and subjected to wet peroxide oxidation in the presence of Fe(II) to digest the organic matter [2]. The resultant solution was filtered, and solid residues were analyzed using Attenuated Reflectance Fourier Transform Infrared spectroscopy (ATR FT-IR) and Field Emission Scanning Electronic Microscopy (FESEM) [3]. It was found that the 80% of microplastics contained in water samples were identified as polyethylene (PE), polypropylene (PP), polystyrene (PS), polyvinyl chloride (PVC), nylon, polyurethane (PU) and mixtures of PE/PP.

[1] W.C. Li, H.F. Tse, and L. Fok, *Sci Total Environ.* **566-567** (2016) 333-349.
[2] J. Masura, J. Baker, G. Foster, and Courtney Arthur, *NOAA Technical Memorandum NOS-OR&R-48* (2015).
[3] M.R. Jung, F.D. Horgen, S.V. Orski, V. Rodriguez C., K.L. Beers, G.H. Balazs, T.T. Jones, T.M. Work, K.C. Brignac, S.J. Royer, K.D. Hyrenbach, B.A. Jensen, and J.M. Lynch, *Mar. Pollut. Bull*. **127** (2018) 704-716.