Influence of natural biofouling in the degradation and identification of polypropylene

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Abstract

Polypropylene is one of the most produced plastics in the world which is eventually discarded into the environment. Once released, plastics may degrade through several agents, as formation of biofouling in the polymer surface that can alter the weathering process affecting their flotability, or slowing photochemical degradation through light screening.
In the frame of the MicroplastiX project (JPI Oceans) 9 different polymers, were exposed to marine environment throughout the summer season in Ría de Ares, A Coruña. Samples were subsampled at T0, T7, T15, T30, T60 and T90 days of exposition.

This study focuses on the characterization of the changes that biofouling growth produces in polypropylene using ATR-FTIR, identifying new bands in its spectrum and studying how this process interferes with natural weathering and with the identification in monitoring studies of plastics and microplastics. Measurements of biofouled and non-biofouled PP are made after soft digestion (10% H2O2, 40ºC) to identify the origin of the new bands in their IR spectra.

Moreover, SEM microscopy was also done in order to study the changes caused by biofouling growth or natural weathering, and even to identify some of the organisms growing on the surface of the plastic.

Preliminary results indicate that biofouling growth is visible in the spectrum within a few weeks of exposure to the marine environment, producing, at T90, a significant change in the ATR-FTIR spectrum. It also appears that, the growth of biofouling on the surface of the polymer exerts a protection against ageing (mainly photo-oxidation).
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