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MASTER THESIS PROJECT

LONG-TERM DEGRADATION OF FISHING NETS THROUGH ACCELERATED AGING EXPERIMENTS: KINETICS OF MICROPLASTICS AND NANOPLASTICS PRODUCTION

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ABSTRACT

One of the goals of the EU is to reduce the amount of plastic litter in the marine environment by 30%. The fishing net comprises one of the sources of secondary microplastic in the ocean.

This study designed and adopted a protocol of artificial aging and agitation mimicking the action of UV radiation from the sun and the abrasion in the marine environment. Two fishing nets made from polyamide (PA) and polybutylene succinate were studied. Artificial aging of the net was carried out using an optimized UV chamber, and the degradation of the net over time was monitored using FTIR and Raman spectroscopy. The infrared spectra (ATR) were used to calculate the oxidation index for both polymers. The carbonyl index of PBS increased with time. For PA, the carbonyl index and OH index also increased as aging increased. Pearson correlation test carried out on the carbonyl index for PBS and PA gave a significant positive correlation $r(6)=0.955$, $p<0.01$ and $r(6)=0.915$, $p=0.004$ for PA 0.6mm and PBS 0.60mm respectively. OH index of PA 0.60mm is positively significantly correlated with aging time, $r(6)=0.973$, $p<0.01$. Color changes in the polymers were also observed with aging. SEM analysis of the morphology of the aged and agitated PBS 0.60mm fishing nets showed some cracks and holes on the surface of the nets. The plastic particles were identified using Nile red staining with a confocal microscope and SEM. Characterization of the particles with Raman and micro infrared confirms the particles were from the fishing nets, as evidenced by the presence of characteristic bands in the spectra of the analyzed particles.