Microplastics From Mats: How Abiotic Environmental Factors Affect the Degradation of Polyethylene Foam Water Mats Into Microplastics

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Previous research suggests that abiotic factors facilitate the degradation of artificial polymers, such as polyethylene, into microplastics. However, current research has not yet explored how varying abiotic factors impact the degradation of polyethylene foam from a water mat, recreational mats that are frequently seen and used on bodies of water. Microplastics can contain endocrine-disrupting chemicals (EDCs) that have detrimental effects on human and ecosystem health. Due to the widespread nature of microplastics, it is important to understand the manner in which they are created. In order to test the impact of abiotic factors on the degradation of the water mat, an experimental method was employed. 12 treatment groups and 6 control groups were tested. Experimental treatments consisted of UV irradiation and thermal radiation from 2 separate lamps. 6 samples of polyethylene were exposed to different conditions under each lamp consisting of 3 different water types with two samples in each: one subjected to mechanical abrasion and the other without. The amount of microplastics were collected from each sample every 2 weeks. The individual samples were then manually counted in order to quantify the dependent variable. Multiple ANOVA tests were conducted, however only one that analyzed the groupings of light treatment with consideration for mechanical abrasion produced a significant p-value ($p=0.006$) conveying a significant difference between the number of microplastics created from each grouping. Further analysis of graphs produced by the statistical test revealed that UV exposure with mechanical abrasion created the most microplastics out of the groupings.

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