



PHOTODEGRADATION OF OCEANIC PLASTICS

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ABSTRACT

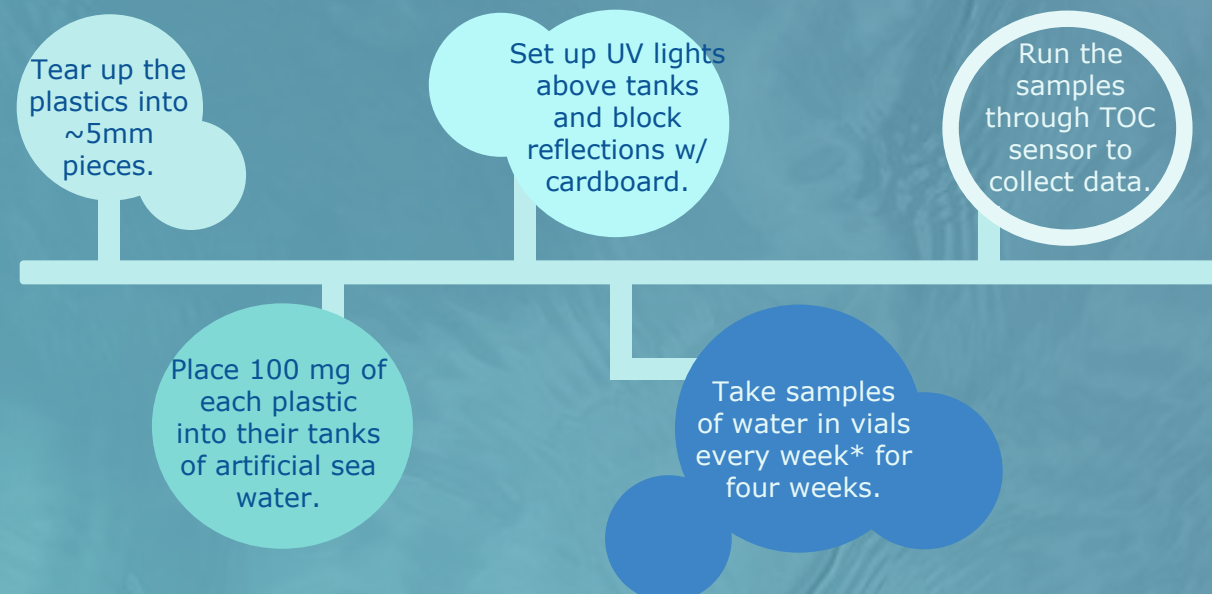
Less carbon dioxide absorption, reduction of phytoplankton population, organismal absorption and ingestion of microplastics, human health concerns: all directly tied to oceanic microplastics. The most common types of commonly used plastics are polystyrene, polypropylene and polystyrene. High concentrations of these types of plastics were tested individually in oceanic conditions and under an ultraviolet light for five weeks. It was found that polypropylene and polyethylene degraded at a much quicker rate compared to polystyrene. In addition, polypropylene degraded at an initial rate of almost twice that of polyethylene, and polyethylene degraded at a constant rate.

INTRODUCTION

Plastic Pollution has been a catalytic, and extremely detrimental issue since the 1960s. Plastics naturally and unnaturally (anthropogenic influence) finds their way into the oceans. This plastic degrades into smaller plastic pieces called microplastics, which make up 92% of all plastic in the ocean (Coyle et al.)

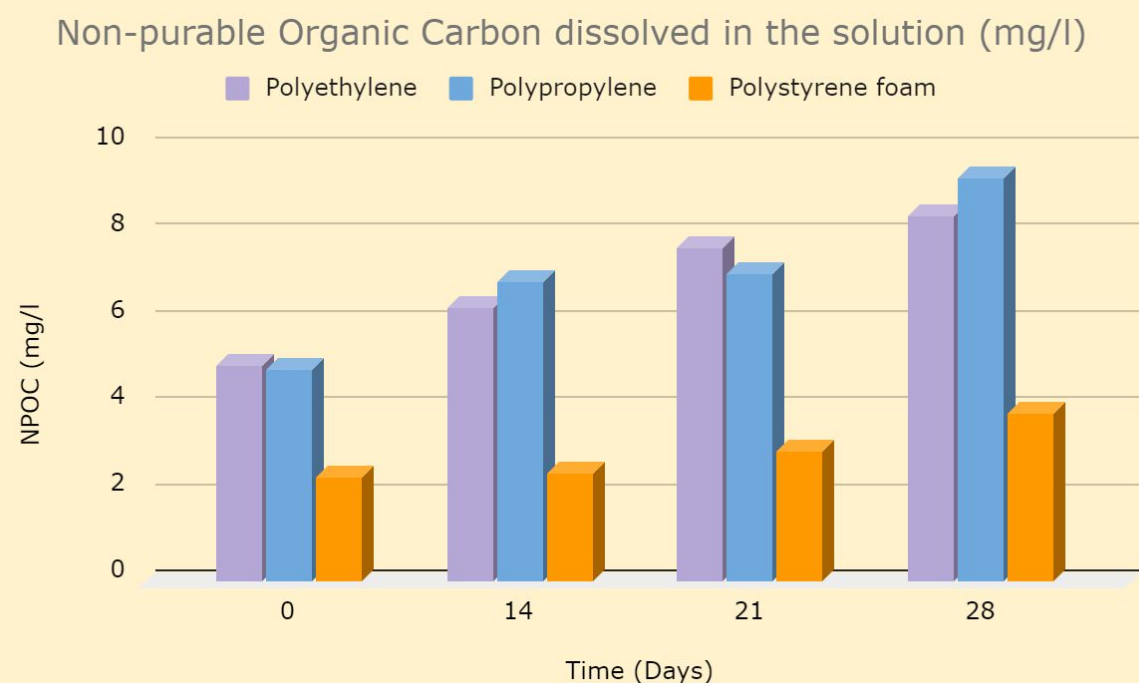
Microplastics are digested by sea creatures and can bioaccumulate, making their way up the food chain, affecting larger animals including humans. Additionally, when microplastics accumulate, they block sunlight, reducing the amount of carbon absorbed by phytoplankton, further catalyzing the increased amount of carbon in the atmosphere. Our project is utilizing the natural process of photodegradation, and investigating which types of common plastic pollutants are most easily degraded by ultraviolet light. We will compile the results into a scientific essay which we will publish and send to plastic production companies, to help spread the information.

METHODOLOGY



Artificial sea water is created from a mixture of 10,000 mL of DI water and 3.5 mg of table salt to mimic 3.5% salinity, stirred once a week after sample collection.

RESULTS



While there was no visible physical change in the plastics, the analysis of the samples demonstrated that a very high amount of Organic Carbon compounds had degraded off the plastic polymers.

DISCUSSION

After compiling all the experimental data, experimental data, we have observed a few trends and correlations and have determined the most photodegradable plastic among the most commonly used industrial grade plastics is Polypropylene, whose Organic Carbon count shot up from 4.919 to 9.314 in only four weeks, Compared to the other plastics Polyethylene (4.976-8.439) and Polystyrene foam (2.405-3.896). With further potential trials and the solidification of this theory, data can be sent to large manufacturing companies along with recommendations on materials to substitute their supplies with the most eco-friendly alternative. Ideally, with this data large manufacturing companies will halt the usage of very harmful, slowly degrading plastics, and this would lead to less of these pollution remaining in the ocean. This experiment also leads to a proof of concept among testing the environmental friendliness of plastics; this method can be used to test all sorts of materials on a larger scale.

