# Biomimetic Removal of Microsphere Water Contaminants, via Calcite-Infused, Coral-Like Melamine Sponges

Park, Naomi (School: Greenwich High School)

The detrimental threat microplastics (MPs) have on the environment is well known. However, their effective and efficient remediation in aquatic environments has yet to be established. This research provides a highly efficient/practical method for the removal of microplastics through the creation of an Artificial Coral Sponge (ACS). The ACS was constructed on a 2x2x1.5cm (150µm-pore) melamine sponge, with a PTFE adhesion layer, and CaCO3 for MP-capture. The ACS removed ~186k-MPs (~93%) in 45hrs, from 0.1mg/ml MP-contaminated seawater. High MP-concentration, long-term experiments were conducted to examine full capacity. Following one week of submersion in 0.5mg/ml MP-contaminated water, SEM analysis highlights MP-retention throughout its internal structure, demonstrating that it is not a surface-only remediation device. Furthermore, at full capacity, the ACS can retain up to 2065k MPs/device. To evaluate ACS reuse properties, an ACS was used 3x in subsequent 0.1mg/ml MP-contaminated seawater. Marginal decline of MP-remediation over 3 “reuses” highlights the ability to reapply the ACS in contaminated water until its MP-limit is reached. Prolonged stability studies demonstrate prolonged ACS integrity, as a marine-safe, easy-to-use MP-remediation tool costing 30¢/tested device, or $12 for a device that mimics a typical 625cm2 coral. Implementation is easy, as it is simply lowered into MP-contaminated water, left until its capacity is reached, and then lifted out for MP recovery. Based on measured “reuse” and maximum-load capabilities of the ACS, a 625cm2 surface area ACS could remediate up to 64.5 million microplastics in 116hrs, when placed in a continuous, 0.1mg/ml MP contaminated water resource.

**Awards Won:**

Second Award of $2,000