A Novel Magnetic System With Carbon Nanotubes To Remove Microplastics From Water

Dedeler, Ayse Pelin (School: Cakabey Schools)

Microplastic pollution due to inadequate water treatment has become an emerging issue, posing a global threat to marine life. Effective and eco-friendly removal solutions are urgently required. The goal of this project is to develop a system that uses nanomaterials to adsorb microplastics (MPs) and remove them from the water via magnetic force. Furthermore, an optical approach to assessing if a water sample is free of MPs is proposed. Magnetic carbon nanotubes(M-CNT) intended to adhere to the surfaces of MPs were achieved by synthesizing carbon nanotubes with magnetite nanoparticles. The obtained M-CNT was added in a 1:1 ratio with MPs to beakers containing known volumes of simulated seawater. The MPs/MCNTs composites were separated from aqueous solutions by a neodymium magnet, and the M-CNTs-adsorbed MPs spectrum is recorded in FTIR; bulk showed characteristic peaks of MPs, thus M-CNT is confirmed to capture MPs. A Zetasizer is used to analyze cleaned water samples, demonstrating that M-CNT can also effectively remove nanoplastics. The subsequent UV/VIS Spectrometer results showed that the sample was cleansed of microplastics with an average of 98% success. For real-life applications of M-CNT, a machine is designed with 3D printing and Lego parts. The machine's magnetic field can be turned on and off by realigning diametrically magnetized disc magnets with servo motors and the NXT brick. This attains the dual goals of moving M-CNTs through the machine and continuously removing microplastics from water. Hence, a novel approach for removing microplastics utilizing unique nanomaterials from aqueous environments has been proposed.