Bio-Inspired Shape-Shifting Material to Reduce Plastic Pollution in the Coastal Regions of Kenya

Chouhan, Diya (School: Shree Cutchi Leva Patel Samaj School)
Shah, Kavya (School: Shree Cutchi Leva Patel Samaj School)
Patel, Khushi (School: Shree Cutchi Leva Patel Samaj School)

The growth of the plastic industry since the 1950s has resulted in an alarming accumulation of plastic waste, with an estimated 8.3 million tonnes of plastic produced globally and 6.3 million tonnes of it becoming waste. A significant portion of this waste, about 3-5% annually, leaks into the world's oceans, contributing to plastic pollution that threatens wildlife, particularly marine animals such as turtles, who ingest plastics. (Pew trust, 2016) Our aim is to create an innovative biodegradable material designed to safely capture and break down plastics, providing a more sustainable and eco-friendly solution to the growing issue of plastic pollution. 40g of PHBV and PCL solution blend was combined with 30g of poloxamer 188 and MCC solution, then 10g of castor oil was mixed and stirred thoroughly. 20g of pre-modified biochar was added to the mixture, stirring continuously. The solvent was evaporated in a warm oven at 30°C for 2 hours, leaving a homogeneous polymer blend with biochar. Film casting was performed by pouring the final mixture into a petri dish, which dried and solidified. The PHBV and PCL solution is a blend of 40g of PHBV and PCL, a biodegradable thermoplastic polymer, which is eco-friendly and flexible. It uses Poloxamer 188 and MCC dispersion to uniformly disperse biochar particles, while castor oil enhances biodegradability and elasticity. Pre-modified biochar provides adsorption functionality and structural integrity. The mixture balances mechanical properties, biodegradability, and pollutant removal for environmental remediation applications.

Awards Won: