Using Microplastics to Sequester Organophosphate Pollutants

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Contaminants of concern such as Malathion (an organophosphate insecticide) pose incredibly dangerous risks to humans and many species vital to their ecosystems. The EPA reports that 97% of protected species in the United States are harmed by this pollutant. Another area of concern regarding environmental protection is the cleanup of plastics, specifically microplastics. This study explores a proposed method for the usage of recycled microplastics to sequester pollutants such as Malathion in contaminated bodies of water. An adsorption study was conducted using polyethylene films, polyethylene microplastics, polyethylene terephthalate microplastics, polystyrene microplastics, and activated carbon (a common bioadsorbent utilized for a standard comparison). The plastics and carbon were stored in sealed glass vials in variable concentrations of Malathion for a period of two weeks to allow the samples to reach equilibrium. Samples were analyzed using UV-VIS spectroscopy and compared in a graphical analysis. Post analysis, it was determined that all forms of microplastic or film successfully adsorbed more Malathion than activated carbon: Polyethylene terephthalate microplastics adsorbed the most pollutant (49.0% adsorption), then polystyrene microplastics (47.9%), polyethylene microplastics (24.5%), polyethylene films (21.1%), and finally activated carbon (14.1%). In conclusion, these plastics could be utilized in a novel method of sequestration of organophosphate pesticides contaminating bodies of water.

Awards Won:
The Scientific and Technological Research Council of Türkiye TUBITAK: 1st Prize Award