Separating Microplastics from Beach Sand Using a Fluidized Air Bed

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Microplastics pose an increasing risk to beach ecosystems around the world. The abundance of microplastics negatively impacts natural processes such as evaporation, water flow, and heat transmission to lower levels of sand, endangering numerous organisms that depend on beaches for their survival. Current systems designed to clean microplastics from beach sand are expensive and have low plastic separation efficiencies. This experiment investigated the use of a fluidized air bed to separate microplastics from beach sand. Fluidized air beds, which force air upward through particulate media resting on a porous membrane to separate particles by density, present possibilities for significant cost savings and improved separation efficiencies. A fluidized bed prototype was constructed that used a leaf blower to force air through a sheet of landscape fabric, causing microplastics to rise to the top for harvesting and weighing. In testing sand mixtures with two common types of plastic, polypropylene (PP) and polyethylene terephthalate (PET), average separation efficiencies of 83 percent for PP and 43 percent for PET were achieved. These results compare favorably with the most common laboratory method for PP and show potential for PET with bed modifications. Fluidization time for this experiment was only 30 seconds, indicating that the fluidized bed prototype can achieve high separation efficiencies in a short amount of time. In addition, materials cost less than $350, suggesting the potential for significant cost savings. Applications of this research include cleaning polluted beaches and laboratory analysis of sediment samples.

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