Analyzing the Difference in the Sorption Concentrations of Copper and Iron in Polylactic Acid and High Density Polyethylene Plastic Bags

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Plastics, especially high density polyethylene, contribute to the pollutant epidemic that harms the planet's environment. Polylactic acid, a polymer derived from corn and other natural sources, has recently been used as a cleaner alternative to high density polyethylene. However, no research had been conducted to determine the sorption qualities of this plastic. The objective of this study was to examine the sorption properties of polylactic acid plastic as compared to high density polyethylene plastic to determine if bags made from polylactic acid sorbed a higher, more dangerous concentration of heavy metals. Both plastic types were soaked in a solution containing iron and copper and then analyzed and compared using an atomic absorption spectrometer. After subtracting the concentration of treated samples from the concentration of untreated samples, the high density polyethylene plastic samples sorbed a mean concentration of 0.464217 parts per million for copper and 34.1526 parts per million for iron. The polylactic acid samples sorbed a mean concentration of 0.669245 parts per million for copper and 35.0245 parts per million for iron. A matched pairs analysis of the data produced a p-value of 0.0102 for copper and 0.0075 for iron which allowed the null hypothesis to be rejected. The polylactic acid samples sorbed a significantly higher concentration of both iron and copper than the high density polyethylene samples. The results indicated that polylactic acid plastic use in the commercial industry is not recommended due to its ability to sorb copper and iron. Further research should be conducted in order to determine the leaching and sorption properties of this plastic with other metals or organic compounds.

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