CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
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Project Number
S0612

Project Title
Chemically Expediting the Degradation of Polylactic Acid

Abstract

Objectives/Goals
The objective of our science project was to see if acids and bases facilitate the hydrolysis of polylactic acid.

Methods/Materials
We chose to test the loud, but compostable three-layered Sun Chips bags, made of 100% polylactic acid (PLA). Using HCL, H2SO4, KOH, and NaOH in 1-molar and 5-molar concentrations, we soaked cutouts of the bag in beakers containing these strong acids and strong bases to facilitate and catalyze hydrolysis of the polylactic acid.

Results
The bags of the acidic solutions were compared those of the basic solutions to see how much degradation occurred. The basic solutions, after about 8 days, had dissolved the clear layer and the metallic layer of the bag and had fragmented the remaining layer. However, the acidic solutions had only dissolved the metallic layer and separated the clear layer from the bag.

Conclusions/Discussion
Through daily observations, we observed that the both kinds of solutions facilitate the hydrolysis of polylactic acid, but because of fragmentation, basic solutions facilitate hydrolysis more efficiently than the acidic ones. Next time, we can use different sources of PLA, particularly plastic ware, disposable cups, etc. In addition, by trying different concentrations of bases, we may be able to find one that is conducive to growing plants.

Summary Statement
Acidic and basic solutions chemically expedite the degradation of polylactic acid through hydrolysis.

Help Received
Used lap equipment at Flintridge Preparatory School under the supervision of Dr. Wahi