CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

T. Alden Ingelson-Filpula

Project Number

J1309

Project Title

Tensile Strength of Biobased Polymers (Bioplastics)

Abstract

Objectives/Goals

To determine how different biomass-based components in the manufacture of biobased polymers (bioplastics) affect tensile strength.

Methods/Materials

A variety of biomass-based agents including tapioca root, corn starch, potato starch, rice starch and agar were used as the base biological components for each bioplastic sample. Following manufacture, the bioplastic samples were tested to determine their tensile strength. The area and dimensions of each sample were kept consistent (controlled), and tensile strength tests were performed utilizing a spring scale.

Results

Tensile strength (calculated in KPa) proved to be highest in the agar-based bioplastic, averaging over 200 KPa. While quantitative results were obtained for the other samples, it was interesting to note that the properties of the corn starch-based bioplastic rendered it untestable. By combining agar with the starch-based components, tensile strength increased. Overall, the agar-based bioplastic appeared most similar to commercial petroleum-based plastics with respect to physical properties and high tensile strength.

Conclusions/Discussion

The appeal of biobased polymers, or bioplastics, as an alternative to petroleum-based plastics has increased in recent years. This is largely in response to the ever-expanding demand for commercial plastics, and greater awareness of the detrimental environmental impacts petroleum-based plastics pose. By determining how different biomass-based components affect tensile strength, manufacturers can better control the ability of bioplastics to perform at equal or greater levels than traditional petrobased plastics. Given the tensile properties of the agar-based bioplastic, expanded opportunities for the use of this renewable biodegradable plastics may result.

Summary Statement

My project measures tensile strength in different biobased polymers (bioplastics), to determine which may best be utilized as an alternative to petroleum-based plastics.

Help Received

I designed, manufactured, and tested the bioplastics myself. I initially required guidance from my father using the formula to calculate tensile strength.