Save the Balloon!

Design a bio-degradable, helium retentive, balloon membrane.

Overview

The purpose of this project is to develop a new membrane material that is thin enough to be suitable as a balloon, degrades quickly (perhaps over a period of days), can hold a charge of helium long enough to be useful and has an attractive appearance.

Students will have an opportunity to interact with an industrial partner that has a keen interest in the possibility of such a material and facilities for performing extensive testing of promising candidates.

Background

Helium filled balloons are popular as toys and party decorations but have recently come under attack because balloons that are released into the atmosphere can travel long distances before deflating or bursting and returning to Earth. The brightly colored partially deflated balloons, or random fragments, look like food to birds and fish but can be very harmful or cause death when eaten.

Helium filled balloons are currently made of either latex or metalized mylar. Latex balloons are claimed to be biodegradable but the degradation time is measured in months or years, plenty of time to cause damage to wildlife.[1] Mylar balloons are not at all biodegradable.

Scope of the project

Student teams will be expected to identify an appropriate set of material property requirements, design experiments to verify that prototypes meet the requirements, create prototype material samples and test them. It will be sufficient to make small membrane samples that can be cast by hand using simple benchtop equipment for prototype testing. Production of full scale balloons is not required.

Relevant material properties may include, but are not limited to, helium diffusion coefficient, membrane mass density, surface smoothness, and susceptibility to degradation by ultraviolet light, ozone, bacteria or other environmental factors.

Multiple teams, or individual students, may develop and execute separate plans to create a new material. The first task of each team will be to provide a milestone schedule based on their assessment of the scope of work.

Teams will meet weekly with the oversight committee and make formal progress presentations at each scheduled milestone.

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[1] https://balloonsblow.org/latex-balloons-still-kill/