CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
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Project Number
J1818

Project Title
Changing the Speed of Light

Abstract

Objectives/Goals
The objective was to accurately measure the refraction indexes of different fluids using air as the constant medium and make comparisons. To accomplish this, an apparatus was constructed to measure light passing through the medium/air interface that clearly demonstrates the physical principle of the propagation of light. It was designed such that the refracted light used the full length of the apparatus and would yield the most accurate measurements. Another goal of the apparatus was to minimize the volume of fluid required for each test to less than one gallon.

Methods/Materials
A laser was used as the light source and it was directed at the air/fluid interface. The beam splits into two beams, one is reflected off of the interface and one is refracted into the liquid medium and to a target area on the bottom of the tank. This sets up two triangles and their opposite and adjacent side lengths can be measured with a ruler. Using these measurements and trigonometry all the angles needed to calculate the Refraction Index is known.
The tank was constructed from glass and silicon sealer was recommended by the local aquarium store. A small laser requiring less than 3V was used as the light source. The laser #holder# was made from wood scrap. To make the measurements as precise as possible washers on a string, tape, and some glass cleaner was also used.

Results
For the Ventura County Science Fair similar oils used for cooking were tested. Corn oil had the highest refraction index out of the tested oils as suspected because it had the highest fluid density. A modification to the laser #holder# was made for the State Science Fair to increase accuracy. This experiment is still in progress.

Conclusions/Discussion
The apparatus can accurately measure the Refraction Index for one gallon samples. The density of the fluid sample relates to the Refraction Index. The laser light can be seen easier in some fluids than others. Regardless of the angle the laser enters the fluid, the Refraction Index is the same-and it should be. Other physical phenomena were observed such as; meniscus of the fluid along the tank wall, scattering of laser light varies depending on the fluid, density and viscosity of fluids. I would like to know more about optics and lasers.

Summary Statement
My project used a homemade tank to test the refractive properties of various oils.

Help Received
Father bought glass and various oils