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PHYS265

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Refraction Data Analysis Report

Introduction:

Using Spyder, I have used the refraction data to find the index of refraction of the new type of

glass developed by the firm. This was done by processing the data, using it with Snell's law, and

looking at the statistical uncertainty of the index of refraction. Following is a summary of the

methods used:

Data Processing and Analysis:

The data had 96 measurements of the angle of refraction at six different angles of

incidence ranging from 10 to 60 degrees. For each angle of incidence, I found the mean and

standard deviation. Then, using Snell's law, I used sine functions to get the values of the sin of

the angle of refraction, angle of incidence, and error. A table with these values is shown below

with a histogram of the data:
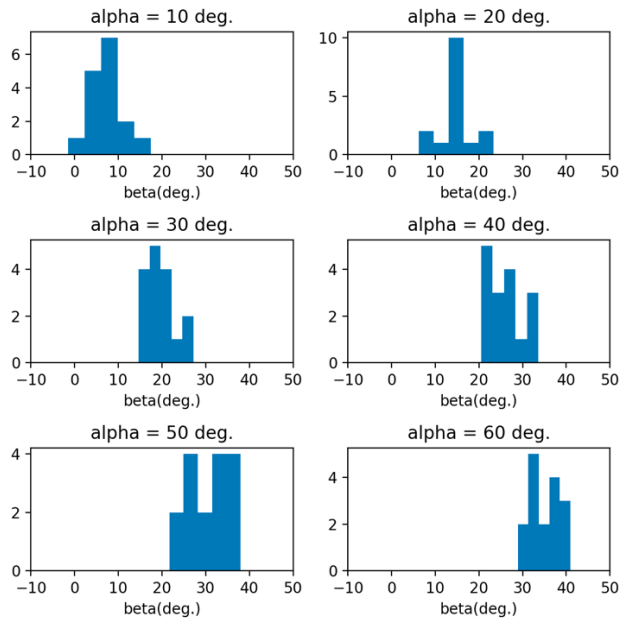
a	Sin(a)	B	Sin(B)	Sin_err(Beta)
10	0.174	0.128	0.127	0.009
20	0.342	0.258	0.255	0.018
30	0.500	0.343	0.337	0.021
40	0.643	0.456	0.440	0.032
50	0.766	0.540	0.514	0.042
60	0.866	0.611	0.573	0.034

Next I made a plot of Snell's Law where I had sin(angle of refraction) vs sin(angle of incidence)

and used error bars to show the uncertainties of the data. Using chi squared curve fit, I found

the best fit line which resulted in the printing of the index of refraction, Chi Squared value,

degrees of freedom, and p-value as shown below:

Sin(B) vs Sin(a)
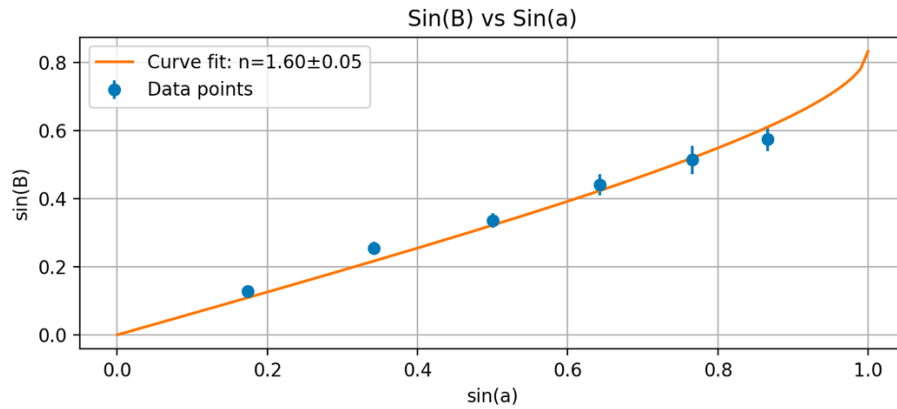
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Best Fit Value of Index of Refraction (n): 1.597 ± 0.05
Chi-squared: 0.0036289
Degrees of Freedom: 5
p-value: 0.999999957857
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Next I plotted the Chi Squared function against the index of refraction which shows where the

chi squared is minimized. I then plotted vertical and horizontal lines show the minimum chi

squared values +/- 1 sigma, resulting in the following plot:

Chi Squared vs Index of Refraction
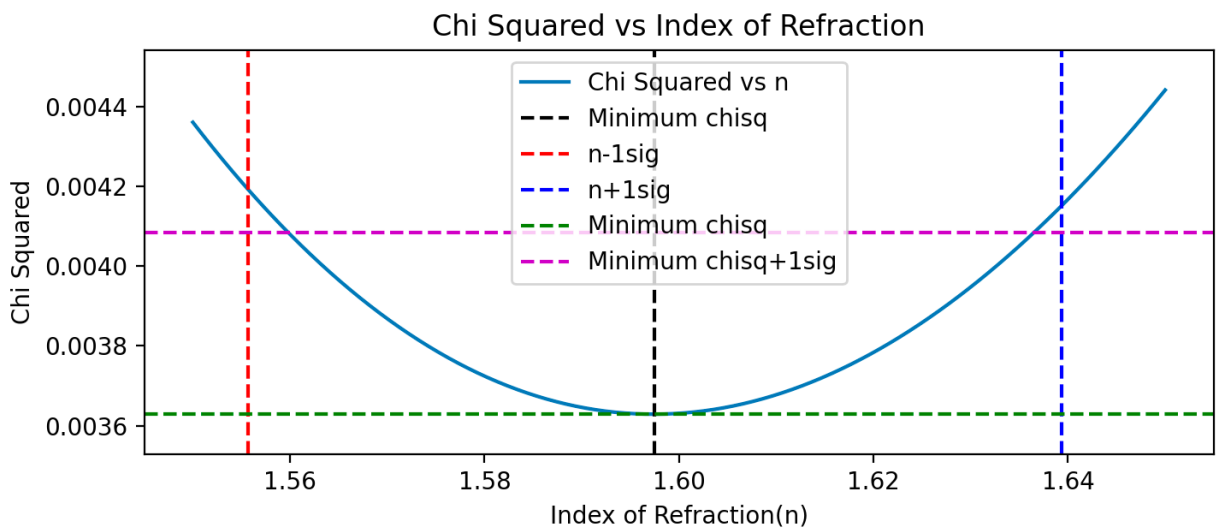
Conclusion:

Based off the calculations shown above, the index of refraction of the new type of glass was

determined to be 1.597 +/- 0.05.