Uniaxial Tensiometer System Experimental Results

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Activity Report

1 Research Question

The primary goal of our improved uniaxial tensiometer system is to increase system accuracy using software improvements. To demonstrate the accuracy of our system, we tested our system on two different types of material (latex and nitrile) and compared the values of Young's modulus and ultimate tensile strength computed from the stress-strain curve to known values for these materials.

2 Experimental Results

Show the following results of your system.

1) Stress-strain curve for latex glove (See Figure 1).
2) Stress-strain curve for nitrile glove (See Figure 2).
3) Table summarizing key metrics (Young's Modulus and Ultimate Tensile Strength) derived from stress-strain curves compared to known values from the original research paper (See Table 1).

The graphs visualize the known value for Young's modulus for both the latex and nitrile gloves as well as the ultimate tensile strengths for both gloves. The experimental error across five trials conducted to achieve these results is also provided to see the accuracy of the system. The known values are provided from the American Society for Testing Materials (ASTM), which requires a minimum ultimate tensile strength for latex and nitrile gloves used in exam settings.

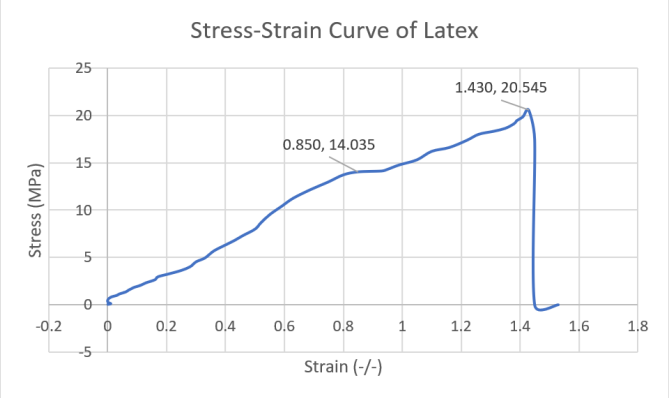

Figure 1. Stress-strain curve derived from our system for Latex glove sample

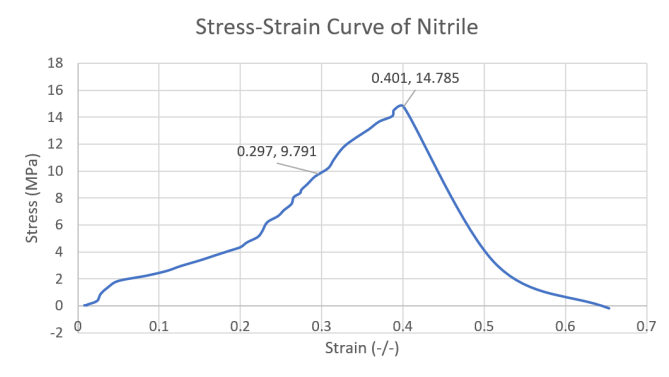

Figure 2. Stress-strain curve derived from our system for nitrile glove sample

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Metric	Sample	# Trials	Our System	Known Value	Error
Young's Modulus	Latex Glove	5	1.35 ± 0.2 MPa	1.2 ± 0.1 MPa	$\pm 12.50\%$
..	Nitrile Glove	5	2.13 ± 0.2 MPa	2.4 ± 0.2 MPa	$\pm 11.25\%$
Ultimate Tensile Strength	Latex Glove	5	20.5 ± 0.1 MPa	18 - 36 MPa, avg 20 MPa	$\pm 2.5\%$
..	Nitrile Glove	5	14.8 ± 0.1 MPa	14 - 30 MPa, avg 16 MPa	$\pm 7.5\%$

Table 1
Summary of experimental results from multiple trials

3 Data Analysis