Measuring bioplastic elasticity

Materials

ring stand
2 - S-hook clips
bioplastic sample
ruler
caliper
electrical tape
500g slotted weight set

Procedure

1. Cut the bioplastic sample to approximately 1.5 cm wide by 9 cm long. *If using an ice tray to mold bioplastic, you may skip this step.*
2. Using a caliper, measure the initial thickness (in millimeters) and width (in millimeters) of the bioplastic sample.
3. Cut two pieces of tape that are approximately 9 cm long. Wrap each end of the bioplastic sample with tape.
4. Place a clip on each end of the bioplastic sample. The clip should clamp only on the tape.
5. Hang the bioplastic sample on the ring stand using one of the S-hook clips.
6. Attach a ruler to the ring stand so that 0 cm on the ruler lines up with the tape line on the sample. (See diagram for setup.)
7. Record the initial length of the sample with no mass attached.
8. Place the hanging mass on the sample. Wait 3 minutes for the material stretching to stop. Record the new length of the sample.
9. Continue adding mass *(in 50g increments)* to the sample and recording the new length. Wait 3 minutes after adding additional mass to record data.

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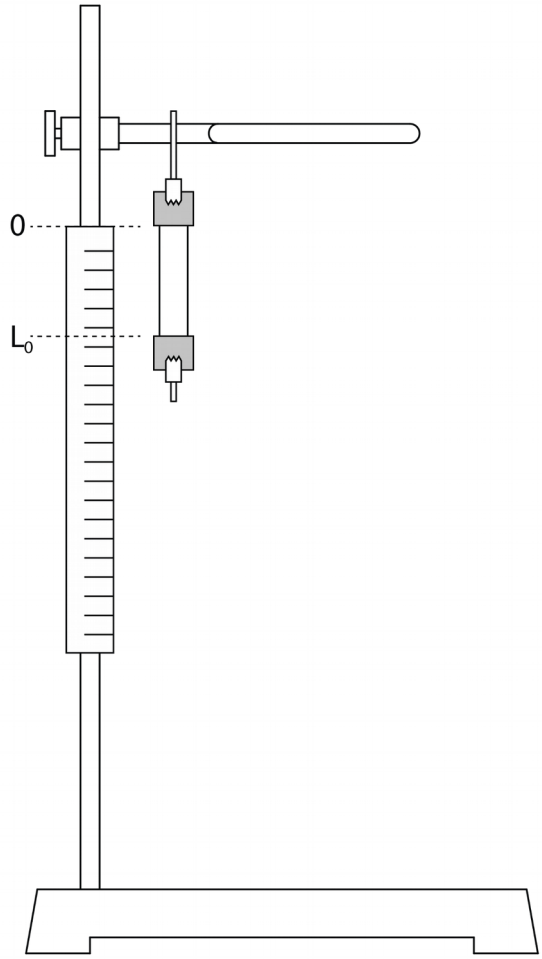

Figure 1. Initial experiment setup and initial length of sample, L_0

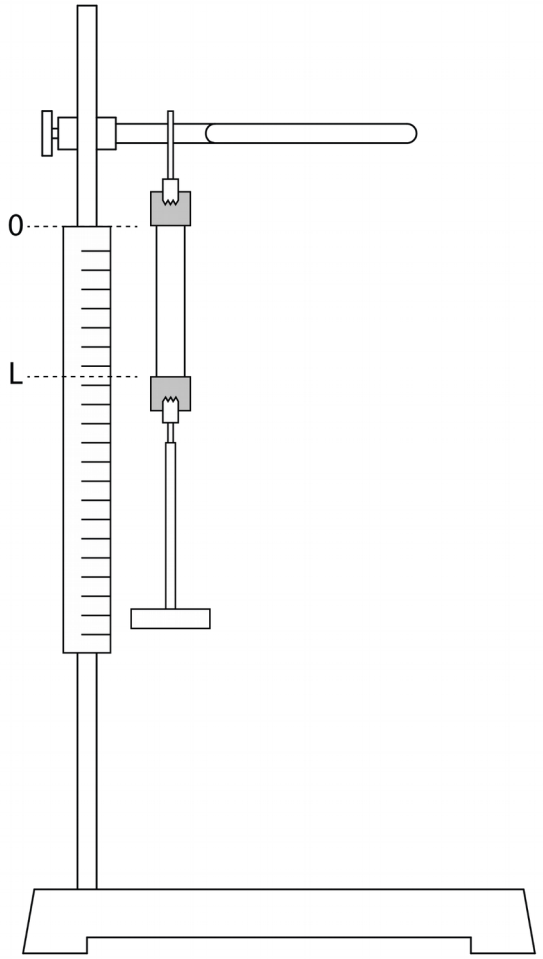

Figure 2. Hanging mass attached to sample and new sample length, L

Data

Sample width (mm)	
Sample thickness (mm)	
Cross sectional area (mm2)	

Mass, m (g)	**Length, L (cm)**
0	
50	
100	
150	
200	
250	
300	
350	
400	
450	
500	

Calculations

1. Calculate the initial cross-sectional area of the sample by multiplying the width x thickness.
2. Make a copy of the Bioplastic Tensile Test Data Template. Enter your data into the table.
3. The stress, σ, *(in kPa)* is calculated using the cross sectional area, A, ***(in mm^2)*** and the mass, m, (*in grams)*.

$$\sigma = 9.81m/A$$

4. The strain, is calculated by dividing the change in length by the original length.

$$= L\text{-}L_0/L_0$$

5. The modulus of elasticity is a measure of the "stiffness" of the material. This is represented by the slope of the trend line shown on the graph. Record the modulus of elasticity below.

Modulus of Elasticity (kPa)	