Coefficient of Linear Expansion

Introduction

The linear expansion of a heated solid or liquid can be measured by a quantity $\alpha$, the coefficient of linear expansion. This coefficient is defined in such a way that it measures the percentage change in the length per degree temperature change.

$$\alpha = \frac{\Delta L}{L_o \Delta T}$$

The coefficient varies with different materials. The purpose of this lab is to use the formula stated above to determine the coefficient of three materials with a specially designed apparatus.

Procedure

Draw a diagram of the apparatus, labeling all major features

Describe how it works

Record measurements in Table 1. Calculate $\alpha$ on the next page and record your findings in the table.

<table>
<thead>
<tr>
<th>$L_o$ (cm)</th>
<th>$\Delta L$ (cm)</th>
<th>$T_i$ (°C)</th>
<th>$T_f$ (°C)</th>
<th>$\Delta T$ (°C)</th>
<th>$\alpha$</th>
<th>Metal?</th>
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Table 1: Measurements to Determine the Coefficient of Linear Expansions for Three Metals
Questions

1. Explain how linear expansion of metal rods could be used as a thermometer. What would be some of the problems with this method?

2. How does the centesimal meter work? (draw a picture if it helps)

3. Calculate the percent error for each of the \( \alpha \) values calculated in Table 1 (using values from your book). What could have contributed to the error in this experiment?