

## 2.1 Activity: The Thickness of Aluminum Foil

### Question

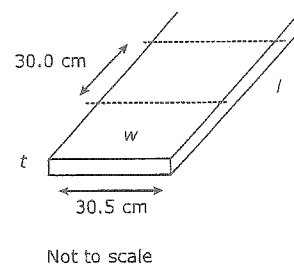
What is the thickness of a sheet of aluminum foil?

### Background

The thickness of a sheet of aluminum foil is an extensive property that is difficult to measure directly with reasonable precision and accuracy. The thickness of the foil can however be derived by dividing its volume by the surface area of one side as proven below:

$$\frac{\text{volume}}{\text{surface area}} = \frac{\text{length} \times \text{width} \times \text{thickness}}{\text{length} \times \text{width}} = \text{thickness}$$

Obviously you can't calculate the volume of the sheet using the formula  $V = lwt$  because you don't know the foil's thickness. You will have to calculate its volume by dividing its mass (another extensive property) by its density (an intensive property).



### Procedure

1. Obtain two pieces of aluminum foil – one should be labelled “L” for light and one should be labelled “H” for heavy.
2. Measure the length of the light piece of aluminum foil and record the measurement in your data table (your measurement MUST include two decimal places).
3. Measure the width of the piece of aluminum foil and record the measurement in your data table (your measurement MUST include two decimal places).
4. Place the aluminum foil on the scale and record the mass in your data table.
5. Repeat with a heavy piece of aluminum foil.

### Results and Discussion

(Answer discussion questions on a separate piece of paper. Round your answers to the correct number of significant figures)

#	Length (cm)	Width (cm)	Surface Area (cm <sup>2</sup> )	Mass (g)	Density (g/cm <sup>3</sup> )	Volume (cm <sup>3</sup> )	Thickness (cm)
L					2.702		
H					2.702		

1. Calculate the surface area of each piece of foil (area = length x width).
2. Calculate the volume of each piece of foil using the mass and density.
3. Calculate the thickness of each piece of foil (thickness = volume/area).
4. Aluminum atoms have a thickness of 0.286 nm = 1 atom. If aluminum atoms were stacked one on top of the other how many atoms thick would the sheet of foil be?
5. Compare your results for thickness to those of other groups. Are they the same? Should the thickness be the same for each type of foil?