

Name: _____

Date: _____ Period: _____

17. Galvanized Metal Lab

Purpose: To determine the thickness of zinc on a sheet of iron.

Description: A small piece of galvanized metal will be measured for area, and massed, before being placed in Muriatic Acid for 15 seconds. Afterwards, the metal will be massed, and the difference assumed to be due to the loss of zinc. Knowing the density of zinc, as well as the atom radius of the zinc atom, the thickness of the zinc will be calculated in terms of cm, as well as number of zinc atoms.

Materials & Chemicals:

| | |
|-------------------------------|------------------------------------|
| Galvanized Metal, about 2"x2' | 1 small beaker (150 ml) |
| micrometer | 6 M HCl solution |
| Beam Balance | (muriatic acid may be substituted) |
| tongs | Safety glasses |
| apron | Rubber gloves |

Hazards: Concentrated solutions of HCl will burn skin and damage clothing. Fumes from acid can be caustic and or irritating; do this experiment in a well ventilated area. (hood, if available). Goggles must be worn.

Procedure:

1. Obtain a sample of galvanized metal, and measure the length and the width using a micrometer. Calculate the area. Because the metal is galvanized on both sides, multiply the area x2 for the total surface area that is galvanized.
2. Mass the metal using a beam balance, to the nearest .005 gram.
3. Taking appropriate safety precautions (gloves and safety goggles), use the tongs to immerse the metal into the 150 ml beaker containing the HCL solution for 15 seconds. Do this in a well ventilated area!
4. After 15 seconds, the rate at which H_2 is produced will drop off noticeably. Remove the metal using the tongs and swish it around in a bucket of water. You may now handle the sample without gloves.
5. Rinse and dry the sample, and then mass again to the nearest .005 gram.
6. Subtract the post mass from the pre-acid mass. The difference is due to the zinc that was removed.

7. Calculate the thickness of zinc using the equation:

$$t = \Delta M_{\text{Zn}} / (\text{Density} \times \text{Area})$$

8. Calculate the number of zinc atoms tall this is by taking the thickness and dividing by 5.32×10^{-8} , the diameter of a zinc atom.
9. To see the effect that galvanization has, use clear tape and tape your sample to this lab sheet, taping all four edges to the paper. Leave the center of the metal exposed. For additional amusement, carefully leave a fingerprint in the center of the metal.

DATA TABLE

| | |
|------------------------------------|--|
| Length of Sample, cm | |
| Width of Sample, cm | |
| Initial Mass of Sample, .005 grams | |
| Final Mass of Sample, .005 grams | |

CALCULATIONS

$$\text{Area of metal} = 2 \times \text{Length} \times \text{Width} \quad (\text{cm}^2)$$

$$\text{Mass of Zinc} = \text{Initial Mass} - \text{Final Mass}, \quad (\text{grams}, .005)$$

$$\text{Thickness of Zinc } t = \Delta M_{\text{Zn}} / (\text{Density} \times \text{Area}) \quad (\text{Density of zinc is } 7.14 \text{ grams / cm}^3)$$

$$t = \frac{\Delta M_{\text{Zn}}}{(\text{Density} \times \text{Area})}$$

$$\text{Number of zinc atoms tall} = \frac{t}{5.32 \times 10^{-8}}$$