**Metallic Bonding**

**(Copper to "Silver" to "Gold")**

**Objective:** You will take a copper penny and bond zinc to its surface. You will then heat the coin to form and alloy of copper and zinc.

**Materials:** Shiny pennies, zinc powder, ring stand, iron ring, wire gauze, Bunsen burner, lighter, evaporating dish, 1M zinc chloride, forceps, stirring rod, water-filled beaker

**Method and Observations:**

•Rinse your pennies in rubbing alcohol.

•Add a teaspoon of zinc powder and 1/2 fill the evaporating dish with zinc chloride. Then add the pennies. Begin heating, stirring often.

•Remove pennies when they are uniformly coated with zinc. ***Drop them in a beaker with water.***

•For "gold" coins take the zinc coated penny out of the water and heat it directly over the burner flame until a change in color is noted, then ***drop them into the water again.***.

**Analysis:**

•What was the cause of the "silver coin"?

•The gold coin is an alloy of copper and zinc. What is the name of this alloy?

•Copper and zinc atoms are virtually the same size. Is this a substitutional alloy or an interstitial alloy? Sketch a diagram of the Copper and Zinc atoms forming this alloy. (The reading on the back of this page should help!)

**Bonding in Metals**

* Metals can easily give up electrons to form an electron “**sea**”
* These cations are surrounded by mobile valence electrons which can drift freely from one part of the metal to another
* **Metallic bonds** consist of the attraction of these valence electrons for the metal cations
* Because of this, metals are….
  + Good conductors
  + Malleable
  + Ductile
* Most metals you encounter on a daily basis are **alloys**, mixtures composed of two or more elements, at least one of which is a metal
* Alloys are prepared by melting a mixture of the ingredients and then cooling the mixture
  + Brass (copper and zinc)
  + Bronze (copper and tin)
  + Sterling silver (silver and copper)
  + Dental amalgam (mercury, silver, zinc)
* Metals can replace each other in an alloy if there are approximately the same size….this type of alloy is called a **substitutional** **alloy**
* If atomic sizes differ greatly, the smaller atoms can fit in the “gaps” between the larger atoms….this type of alloy is called an **interstitial** **alloy**