Physical Change:

Introduction

Demonstrate physical properties, and show how physical change can be used to separate matter. In this activity you will be using heat to separate zinc and copper in a penny.

Equipment

- Lots of pennies 1983 or newer (Note: You may legally experiment and alter your coins as long as you don't misrepresent the coin's true value.)
- Ceramic bowl or crucible
- Eye protection
- Metal tongs
- Heat source: either a propane torch or Bunsen burner

Setup

In this lab, you will be working with open flames and molten metal. It is important to follow all directions and be safety conscious.

See the figures below for the penny melting setup. For either setup, it is important to have your heat source tilted. Angling the Bunsen burner or propane torch will allow the molten zinc to drip from your penny into the ceramic bowl without clogging your flame nozzle. It is extremely important to locate the bowl as close to and directly below your flame source as possible. This will prevent the falling molten metal from splattering.

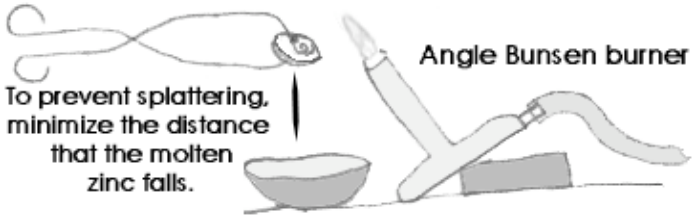

Figure 1: Melting zinc with a Bunsen burner

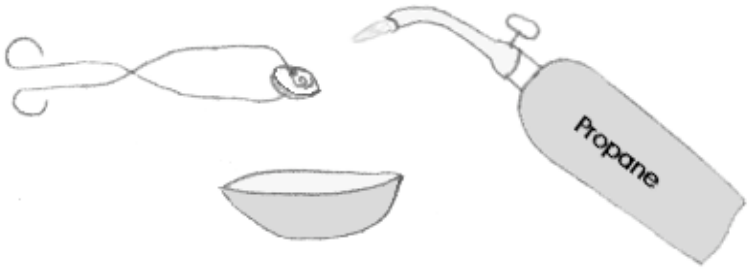

Figure 2: Melting zinc with a propane torch

To Do and Notice

Put on safety goggles. Grab a penny by its edge with a pair of tongs. Hold the penny in the hottest portion of flame, just above the inner blue cone. Within a few seconds, the penny will begin bulging. The copper exterior should start cracking and the molten zinc interior will be visible. When the cracks become large enough, the molten zinc will drip into the ceramic bowl.

If done properly, you've just accomplished the physical separation of the copper (Cu) and zinc (Zn) in a penny. The copper shell should be dangling at the end of your tongs and the zinc should be cooling in a puddle at the bottom of your bowl.

What's Going On?

Copper pennies made after 1983 contain only a small amount of copper and a large amount of zinc. Zinc and copper have very different melting temperatures:

Melting Temperatures

Zn = 692.73°K

Cu = 1356.6°K

In this experiment, zinc changed from a solid to a liquid (physical change). But because copper's melting point is so much higher, the copper remained solid. Since the copper's coating is so thin, it ripped apart, allowing the zinc to leak through the cracks and splat into the bowl.