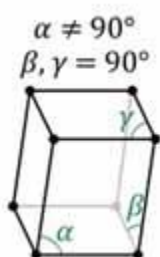


## Laboratory Exercise: Allotropes of Sulfur

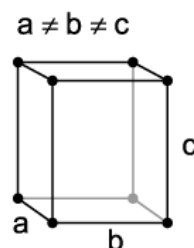
Sulfur is a bright yellow solid that was one of the nine elemental substances known to the Ancients. It can be found naturally in its free elemental form, or as Sulfide and Sulfate salts.



Sulfur occurs in a very large number of allotropic forms. Naturally, solid Rhombic Sulfur is the most common form. When liquified and cooled rapidly, Sulfur crystallizes as Monoclinic Sulfur. These allotropes of Sulfur differ in the general shape of the crystals formed.



(Monoclinic Crystal Shape)



(Rhombic Crystal Shape)

Additionally, when heated hard, the normally cyclic Sulfur molecules decompose into open chains that, when cooled, form an amorphous material known as Plastic Sulfur.

In this laboratory exercise we will convert Sublimed Sulfur into Monoclinic Sulfur and Plastic Sulfur. We then observe the crystal structure of Sulfur's monoclinic allotrope.

## Procedure

**All your measurements must be made to the correct number of significant figures and must have the unit of measurement indicated.**

**Perform the following experiments in the Fume Hood.**

### *Preparing Monoclinic Sulfur*

1. Fold a piece of filter paper into a cone and place it in a ring attached to a ring stand. Your laboratory instructor will demonstrate how to properly fold the filter paper.
2. Obtain a small test tube and fill it about a quarter full with Sublimed Sulfur.
3. Light a Bunsen burner and adjust it to obtain a cool flame. (Your laboratory instructor will show you how to make these adjustments.)
4. Holding the test tube with a holder, gently heat the Sulfur until it is an orange-yellow color and molten.
5. Carefully pour the molten Sulfur into the filter paper cone.
6. Allow the Sulfur to partially cool in the filter paper. Then open the filter paper before the Sulfur has a chance to form a crust.
7. Allow the Sulfur to crystallize.
8. Observe the crystals under a dissecting microscope.

### *Preparing Plastic Sulfur*

1. Obtain a 250 mL beaker and fill it with about 150 mL of Distilled Water.
2. Again fill your test tube about a quarter full with Sublimed Sulfur.
3. Heat the Sulfur hard until it is dark red. Pour the Sulfur into the beaker of Water.
4. Allow the Plastic Sulfur to cool in the Water for about 2 minutes.
5. Remove the Plastic Sulfur from the Water with a spatula and make observations.

### *Combustion of Sulfur*

1. Obtain a Combustion Spoon and fill it partially with Sulfur.
2. Light a Bunsen burner and place the cup of the Spoon along the edge of the flame.
3. Allow the Sulfur to become molten and then ignite.
4. Make observations concerning the burning Sulfur.

## Allotropes of Sulfur

### *Sublimed Sulfur*

Obs:

### *Preparing Monoclinic Sulfur*

Obs:

### *Preparing Plastic Sulfur*

Obs:

### *Combustion of Sulfur*

Obs:

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Signature: \_\_\_\_\_

## Post Lab Questions:

1. What is the definition of a Plastic? Are your observations concerning Plastic Sulfur consistent with this definition? Explain.
2. During combustion, what is the Sulfur reacting with? What is the product of this reaction? List some of the characteristic properties of the reaction product.
3. What is Sublimation?