

Renewable Energy

Lab 8 – Energy Content of Fuels - Bomb Calorimeter

Fall 2010

Name _____

Name _____

Name _____

Introduction/Purpose:

In this exercise, we use a Bomb Calorimeter to measure the energy content in fuels. This technique like the fuel burner uses the temperature rise of a known amount of water when heated with burning fuel to determine the energy output. In this case the flow of heat is more carefully controlled and the results should be more accurate.

Apparatus: Bomb Calorimeter, Electronic Balance, Various Fuels

Theory:

We will again make use of ideas we learned in the energy conversion lab to explore the amount of energy in a specified amount of various fuels. In this case, the combustion will occur quickly and completely in a closed stainless steel container called a bomb. When you see it, you will understand why. The bomb will be completely immersed in a water bath so that all of the energy produce can be easily collected. The temperature increase of the water will be used to determine the amount of energy produced. All of this will be done under computer control and the results will made available on the web site for the particular bomb calorimeter.

Procedure:

1. Fill calorimeter bucket with 2000g of water (distilled). It may be easiest/fastest to do this by weight.
2. Mass sample and place in fuel capsule
3. Take a 10cm string fuse and fold it in half over the wire. Twist the remaining fuse to touch the sample
4. Place the bomb head in the bomb cylinder making sure it is tightly sealed
5. Set the screw cap on the bomb and tighten
6. Close the outlet valve so that no air will escape
7. Slide the oxygen connector onto the inlet valve and push it down as far as it will go
8. On the screen of the calorimeter press Fill O2. This will take 1 minute.
9. Unattach the connector and insert the lifting handle into the two holes on the side of the screw cap. Use this handle to place the bomb into the filled calorimeter bucket.
10. Press the banana plugs into the terminal sockets on the bomb head before the bomb is completely submersed underwater.
11. Lower the bomb into the bucket with its feet around the protruding circle and remove the lifting handle
12. Close the lid while keeping the leads from becoming entangled with the stirrer
13. Hit the start button and enter in the bomb ID and mass of the sample.
14. When the reaction is finished check the website according to your machine

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You will see a report like this when click on your sample under the "Sample Data" menu:

	6100 Calorimeter Report		
Sample ID:	CANDY2	Mode:	Determination
Type:	Preliminary	Date/Time:	10/19/10 15:05:47
Sample Weight:	1.0317	Method:	Dynamic
Spike Weight:	0.0000	Bomb ID:	2
Fuse:	15.0000	EE Value:	2394.8567
Acid:	10.0000	Sulfur:	0.0000
Jacket Temperature:	23.6419	Initial Temp.:	26.8320
Temperature Rise:	1.6580		
		Gross Heat:	3820.4895
			cal/g
Run List Home			

15. Clean out the bomb and start over with a different sample

Questions:

1. What happens in the bomb during combustion?
2. Is all the energy used to combust the sample? If not where is it used?
3. List the results from your samples in cal/g (or other units) and compare your different samples. Were you surprised with the results?