



APPLICATION NOTE | DDS CALORIMETERS

C1.6 ALTERNATIVE ENERGY SOURCE SAMPLE – P4 ARA FRITZENS

INTRODUCTION

Many institutions are doing research and development on alternative energy source.

Alternative energy refers to energy sources, which are not based on the burning of fossil fuels or the splitting of atoms. The renewed interest in this field of study comes from the undesirable effects of pollution (as witnessed today) both from burning fossil fuels and from nuclear waste byproducts. Fortunately there are many means of harnessing energy, which have less damaging impacts on our environment.

Part of the research involves determining the calorific value (energy content) of the alternative energy source.

Institutions performing this type of research include:

- Universities
- Research Facilities
- Government or private industries

SAMPLE PREPARATION

Many samples once they have been ground into a powder will not easily press into tablets using a pellet press, because the fibres will not adhere to each other irrespective of the pressure exerted during the pelleting process.



An alternative method to ignite the sample without it splattering during the burning process is to place the powder (ground sample) inside a gelatine capsule. The capsule ignites easily thus causing the sample to ignite while confining the sample during the ignition phase.

The calorific value of each batch of gelatine capsules must be determined. This value along with the mass of the capsule is used in the spike application of the calorimeter.

SPIKE METHOD

Turn spiking "ON" on the calorimeter. A selection of 10 capsules must be analysed as normal samples. From the 10 results an average calorific value for the gelatine capsules can be determined. This value is then used as the spike value in the calorimeter.

When doing a spike determination, follow this procedure:

1. Tare the balance
2. Place the capsule on the balance pan
3. Enter the mass of the capsule into the "Spike Moves" of the calorimeter.
4. Tare the balance again with the capsule on the pan.



Manufacturers of CAL2K/CAL3K Oxygen Bomb Calorimeters

5. Open the capsule and fill with sample, close the capsule, clean off excess sample on the outside and replace on balance pan.
6. Transfer (manually or automatically) the mass of the sample to the calorimeter.
7. **Please note: If the calorific value is very low (less than 10MJ/kg) then 2 or more capsules may be required per determination.**
8. Insert the capsule into the crucible, ensuring that the firing cotton touches the capsule.
9. Continue the determination in the normal manner.
10. After a determination inspect the inside of the vessel for any signs of splattering and also check the crucible for any un-burnt sample. If there are signs of either then discard the result.
11. The result displayed already has the energy value of the capsule removed from it.
12. After every determination clean the inside of the vessel and the crucible before starting the next determination.

RESULTS

P4 ARA Fritzens Sample Whole P4 / ARA Fritzens Sample Crushed



| | RESULT | MASS | SID | DATE | BN | INIT DRIFT | FIRING TEMP | AMBIENT TEMP | RS | FINAL TIME |
|-------------------------------|--------|--------|-----|------------|----|------------|-------------|--------------|----|------------|
| Calibration | 26.454 | 0.5704 | 794 | 26/07/2006 | 1 | 0.0017 | 15.0 | 17.4 | OK | 9.9 |
| 1 | 10.205 | 0.5007 | 795 | 26/07/2006 | 1 | -0.0004 | 17.1 | 18.1 | OK | 1.3 |
| 2 | 9.706 | 0.6151 | 796 | 26/07/2006 | 1 | -0.0016 | 20.7 | 18.8 | OK | 4.0 |
| 3 | 9.833 | 0.6334 | 797 | 26/07/2006 | 1 | -0.0007 | 18.8 | 19.6 | OK | 2.0 |
| 4 | 10.221 | 0.7210 | 798 | 26/07/2006 | 1 | -0.0008 | 19.7 | 20.0 | OK | 2.2 |
| 5 | 10.124 | 0.6654 | 799 | 26/07/2006 | 1 | -0.0005 | 19.2 | 20.5 | OK | 1.5 |
| 6 | 10.060 | 0.7008 | 800 | 26/07/2006 | 1 | -0.0003 | 19.6 | 20.9 | OK | 2.2 |
| 7 | 9.796 | 0.5918 | 801 | 26/07/2006 | 1 | 0.0015 | 20.3 | 21.4 | OK | 3.9 |
| 8 | 10.239 | 0.6834 | 802 | 26/07/2006 | 1 | 0.0001 | 19.8 | 22.2 | OK | 1.5 |
| Control | 26.493 | 0.5114 | 803 | 26/07/2006 | 1 | 0.0014 | 21.3 | 22.5 | OK | 2.3 |
| Average MJ/Kg = 10.023 | | | | | | | | | | |

CONCLUSION

The calorific value of almost any alternative energy source type can be determined. Calorific value analysis of this nature is one of many results required to determine the energy content of these substances.