**Experiment 2:**

Specific Heat of Aluminum

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**Purpose**: The purpose of this experiment is to review the physical concepts and relationships of heat flow in and out of materials, to apply the concept of conservation of energy with heat flow, and specifically to determine the specific heat of aluminum.

**Data**:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **mal** | **N** | **T** | **N** | **mcup** | **Ti,w** | **∆Tw** | **c ̅Al,exp** | **c ̅Al,acc** |
| **(g)** | 5 | **(℃)** | 5 | **(g)** | **(℃)** | **(℃)** | **(cal/(g℃))** | **(cal/(g℃))** |
| 42.78 | **`x** | 22.7 | **`x** | 7.4 | 22.7 | 6.3 | 0.189302402 | 0.215 |
| 42.83 | **g** | 22.9 | **c** | **mcup+w** | **Ti,Al** | **S∆Tw** | **Sc̅\_Al,exp** | **c ̅w** |
| 42.98 | 42.86 | 22.7 | 22.856 | **(g)** | **(℃)** | **(℃)** | **(cal/(g℃))** | **(cal/(g℃))** |
| 42.78 | **Sx** | 23.1 | **Sx** | 99 | 100 | 0.22991303 | 0.007056753 | 0.99823 |
| 42.93 | **g** | 22.8 | **c** | **mw** | **Tf** | **∆TAl** |  |  |
|  | 0.090829511 |  | 0.16257306 | **(g)** | **(℃)** | **(℃)** | **Reported Value** | **%diff** |
|  | **S`x** |  | **S`x** | 91.6 | 29 | 71 | 0.19±0.0071 | 11.952371015 |
|  | **g** |  | **c** | **Sm\_w** |  | **S∆T\_Al** |  |  |
|  | 0.040620192 |  | 0.072704883 | **(g)** |  | **(℃)** |  |  |
|  |  |  |  | 0.1284523 |  | 0.16257306 |  |  |

Table : measurements and calculations

**Calculations**:

= 0.189 cal/g - C

**Discussion**:

In the experiment, the specific heat of aluminum was calculated to be 0.189 +-.007 cal/g-C. The final result was calculated from the measured temperatures and masses. This value is fairly low, and the %diff is nearly 12% which is fairly high. In addition, the data fails the precision-accuracy test, the accepted value in not within our margin of error. If the experiment were to be repeated it may be better to use the kind of thermometer that does not have to contact the material in question. It is possible that one of the causes for this inaccuracy is due to the mass of the thermometer absorbing heat. It could also simply be a matter of difficult to read tools or just inherently imprecise tools.

**Conclusion & results**:

Specific heat of aluminum = 0.189 +-0.007 cal/g-C

%diff = 11.95%

The specific heat of aluminum was calculated to be 0.189 cal/g-C. This figure is quite low and is likely the result of bad data. The inaccuracies were likely part of the measurement process. S

**Questions**:

1.) This would raise the heat capacity and give a measurement too low due to additional material absorbing energy.

2.) Improperly calibrated instruments are sources of systematic error.

3.) The final equilibrium point would be lower with the additional mass to absorb heat.

4a.) Cal = .2036 cal/g – C

%diff = 5.282%

4b.) Cal = 0.1788 cal/g - C

%diff = 16.8468%

4c.) The change in temperature affected the outcome more dramatically.