**Experimental determination of *H*f (MgO)**

Perform either reaction a or reaction b:

**Reaction a:**

***H*reaction of Mg(s) + 2HCl(aq) → H2(g) + MgCl2(aq)**

1. Perform the reaction above with about 10 cm magnesium ribbon and 30 cm3 1 mol dm-3 HCl(aq) in a beaker, after having calculated ***roughly*** how to dilute the concentrated HCl (37% by mass) and having diluted it. Record the accurate mass of your magnesium.

**Reaction b:**

***H*reaction of MgO(s) + 2HCl(aq) → H2O(g) + MgCl2(aq)**

1. Perform the reaction above with about 0.5 g magnesium oxide and 30 cm3 1 mol dm-3 HCl(aq) in a beaker, after having calculated ***roughly*** how to dilute the concentrated HCl (37% by mass) and having diluted it. Record the accurate mass of your magnesium.

**All:**

2. Measure the temperature of the acid and of the reacting solution with the Pasco Capstone equipment and software, and don’t forget the cooling curve.

3. Calculate Tmax using the method in your textbook, i.e. draw a tangent to the cooling curve and use the temperature where the tangent crosses the time at the start of the reaction. This way you cancel the influence of the heat loss to the surroundings.

4. Calculate Q, nMg, nHCl, and *H*reaction for the reaction your group just performed

5. Combine your values with the value of

H2(g) + ½O2(g) → H2O(l) *H*C = -285 kJ mol-1

and

*H*reaction of the reaction your classmates have got

and calculate

***H*f (MgO)**

6. Find a tabulated value for *H*f, MgOand compare it with your value. Comment!

7. Write a report according to the standard Lab report instructions you have got. In addition to this also answer the following questions:

**Student’s evaluation:**

1. How did you contribute to the group’s work?
2. How did the other group members contribute to your task?
3. What have you learned from this task? Remember e.g. the use of the measuring equipment and software, data handling, calculations, theory, report writing, e.t.c.)
4. Which grade would you give yourself for the entire job?

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **I feel really insecure** | **... a little insecure** | **... quite secure** | **...really secure** | **Motivation** |
| I can set up the measuring equipment |  |  |  |  |  |
| I know how to use the software |  |  |  |  |  |
| I can follow instructions |  |  |  |  |  |
| I can perform the measurements |  |  |  |  |  |
| I can handle the data as needed |  |  |  |  |  |
| I can transform and handle the graph as needed |  |  |  |  |  |
| I understand and can do the needed calculations to get the answer to the research question |  |  |  |  |  |
| I understand and can do the needed uncertainty propagation calculations |  |  |  |  |  |
| I understand the theory behind this practical work. |  |  |  |  |  |

**Teacher evaluation:**

1. The student’s engagement
2. The quality of the report according to given specifications
   1. Research question, variables
   2. Method description
   3. Raw data, quantitative including uncertainties as well as qualitative
   4. Data processing, graphs and calculations, including uncertainty propagation calculations
   5. Conclusion as well as justification of the conclusion based on the results
   6. Analysis of the result, including comparison with literature/tabulated value
   7. Evaluation of result and method, including strengths, suggestions for improvement as well as suggestions for extension of the investigation.
3. Has the student learned something?

These requirements are according to the IB practical work and report writing criteria, so the teacher has to change the requirements according to what is realistic.