Mass of magnesium

Method1

Mass of Mg = 0. 12g

Volume of Hydrogen = 128cm3

Treatment of results

Mg + 2HCl ==> MgCl2 +H2

* n= v? V ==> 128 ? 24000 = 5. 33? 10-(moles

* mole ratio is 1: 1, therefore moles of mg that reacted= 5. 33? 10-(moles

* RAM of Mg (n= m? M ==> M= m? n) ==> 0. 12 ? 5. 33? 10-(= 22. 51

Method2

Mass of magnesium from method 1 = 0. 12

Weight of boat = 44. 17

Weight of boat with solution = 52. 84

Weight of boat with salt (MgCl2) = 44. 74

o Mass of MgCl2 formed = 44. 74 ? 44. 17 = 0. 57

o Mass of Cl- ions = 0. 57 ? 0. 12 = 0. 45g

o n= m ? M = 0. 45 ? 35. 5 = 0. 013moles

o n= m ? M = 0. 57 ? 24. 3 = 0. 023moles

EVALUATION

Method Result

1 22. 5

2 18. 9

Expected 24. 3

From looking at the end results in both methods, I can clearly see that method 1 was the more accurate and appropriate way to determine the mass of magnesium. This is because out of both results, method 1 had the closer answer to the expected than method 2. Method1 only had a difference of 1. 8 from the actual RAM of magnesium, whereas Method2 had a difference of 5. 4- which is quiet a large difference. We cannot depend on just looking at the result that we got from the experiments to settle the more significant method, so I will work out the %errors for both experiment methods to see by what percentage my results were from the expected result.

% error of experiment = difference between result & expected x100

Expected result

Method1: (1. 8 ï¿½ 24. 3) x 100= 7. 4%

Method2: (5. 4 ï¿½ 24. 3) x 100= 22%

The percentage errors for both methods are quiet high, so this suggests that maybe both methods were not very significant. Method 1 is still better than method2 even though the experiment error was 7. 4%, which is a high and insignificant percentage, but it is still more accurate than method 2 as the %error was 22%, which is too high and the result is too different from the expected.

Surely, because I used the solution that was produced in method1 to carryout method2, then the results that I expected should have been similar for both methods. Rather they had a difference of 3. 6; this indicates that it was either an error caused by the procedure I was taking or maybe the measurement errors of the apparatus I used in method 2. Firstly I will calculate the procedural errors on both methods to see how they would have affected the RAM of magnesium – then I will calculate the measurement errors of the apparatus I used to see how they affected the RAM of magnesium so as to conclude which method is more accurate.

PROCEDURAL ERRORS

Procedural error

Effect on measurement

Effect on final result

The Mg strip could have had impurities on the coating such as oxygen.

1. Mass of Mg could have been higher than should have been.

2. lower volume of H_2 produced than if it was pure Mg

RAM of magnesium would have increased by ï¿½ 0. 01. therefore mass of Mg; 0. 12+0. 01= 0. 13

Then RAM of Mg would have been; 0. 13 ï¿½ 5. 33? 10-(= 24. 4. more than expected result but a more accurate value since its out by 0. 1.

Loss of H2 before placing bung

This lowers the volume of hydrogen gas measured that was produced from experiment.

Lowered the RAM of magnesium at the end because it lowered the moles of H2 that we collected therefore lowering the moles of Mg that reacted.

Both methods were only carried out once

The results that we got could have been anomalous results.

If the results were anomalous, this could have explained why the RAM in method2 was so far from the expected.

Improvements: to minimise the procedural errors, we could have repeated the experiments in both methods at least 3-4 times because in this case we would have been able to recognize the anomalous results and worked on the more accurate results. Because in method2, the reason for getting 22% experiment error could have been due to human error and we did not realize because we only carried out the experiment once. Also this makes the results for both methods unreliable.

Another possibility would have been to use a magnesium strip that was not coated with any impurities, this is because even though we spent time cleaning the strip, there were still some impurities left on it that we could not take off, therefore it was not pure magnesium and some weight was added to it therefore increasing the RAM at the end.

A major improvement that would have had a great effect on method2 would have been if we used a separate magnesium strip and made a separate solution of MgCl2 from the first one to work out the RAM of Mg in method 2, or maybe get a ready prepared solution of MgCl2 to carry out the 2nd method. This is because all the errors that we made in method1 are included in method2 because of using its product.

MEASUREMENT ERRORS:

% uncertainty = ? value/uncertainty ? 100

Measurement

e. g. (0. 01 ï¿½ 0. 12) x 100 = 8. 3333 >> 8. 3%

Method1:

Measurement error / Apparatus

2d. p. balance

250 cmï¿½ measuring cylinder

10 cmï¿½ Pipette

ï¿½ value

0. 01g

2cmï¿½

0. 04cmï¿½

% error

8. 3

1. 6

0. 4

Modification

Use 3d. p balance

………….

………….

Why it is better and how it will improve experiment

More accurate measurement. Would have been; (0. 001 ï¿½ 0. 124) x100 = 0. 8% error which is much more less effective than a 2. d. p. balance

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Significance of error

Effective

Not significant

Not significant

Total method %error = 10. 3%

If we had used a 3. d. p balance, then the results that we would achieve would have been very different because with a 3. d. p balance the total method error would have been: 2. 8% – which is a very small % error and quiet ineffective as compared to 10. 3%.

Method2:

Measurement error / Apparatus

10 cmï¿½ Pipette

2d. p. balance

ï¿½ value

0. 04cmï¿½

0. 01

% error

0. 4

8. 3

(0. 01 ï¿½ 0. 12) x100 = 8. 3%

Modification

…………..

Use 3d. p balance

Why it is better and how it will improve experiment

………………

More accurate measurement. Would calculate to 0. 8% error.

Significance of error

Not significant

Effective

Total method %error= 8. 7%

With 3. d. p. balance, measurement error would be: 1. 2% errors – huge difference so have had a great difference in my end result for RAM of Mg.

Improvements: The most effective measurement error was the 2. d. p balance with 8. 3% error; this indeed had a great effect on both methods because we weighed the magnesium strip for the 1st method, then used its product to proceed with method2; so it was therefore an error carried forward. If we had used a 3. d. p balance at the beginning of method1, we would have had more significant because 3. d. p is a higher degree of accuracy than 2. d. p.

Also the measuring cylinder although its error was insignificant, but because we had to read it upside down, this increased the chances of us making an incorrect reading; therefore having an error carried forward.

Overall, according to the measurement errors, method 2 seems like a more significant and accurate procedure to follow in order to determine the RAM of an element. I think this because it uses less apparatus with low measurement errors which reduces the total measurement error for the method; therefore it gives a more reliable result having a small effect on the final result. The reason to why when I did the experiments method1 seemed more accurate was possibly because of the errors carried forward to method 2 on top of its own errors.

RELIABILITY:

I feel that my results were not reliable because reliability is repeatability – and I did not repeat any of my methods. If I had repeated my experiments at least 3 times, I would have been able to recognize any anomalous results and therefore would have gained more accurate and reliable results for the RAM of Mg.