Chemistry – reactivity serires report essay sample

Science, Chemistry

Introduction:

What is the reactivity of metal?

The reactivity of metal was the rate of metal which it would be reacting with each others. The higher the reactivity was, they could have replaced the more other kind of metal in the metal solutions. The metal who has the highest reactivity now is Potassium (K).

What is metal?

Metal is elements, there were more than 50 kinds of metals scientists have discovered today. The metal have different reactivity rate. Just like the Food Chain, higher reactivity metal can replace the lower reactivity metal when the reactions have occurs.

How the reactions can occurs?

The reaction occurs when a metal have replaced the other kind of metal in a solution, as example, When Magnesium have be drop into a Iron Sulphate solution, reaction occurs. Magnesium will take over irons placed, and formed Magnesium Sulphate solution, and left with Iron crystal.

The Word equation will be:

Magnesium + Iron Sulphate Magnesium Sulphate + Iron

The Symbol equation will be:

Mg + FeSO4 MgSO4 + Fe

What if both the metal and metal solution was the same?

When both metal and metal solution are the same, there would be no reaction occurs, because they have the same properties and the same reactivity Series.

How the temperature could helps on reaction?

When the temperature were much higher, it would be reacting faster, the reason for this was that the molecules in the solution have gain energy from heat, so they move faster, therefore they will be reacting faster.

Planning:

Aims:

In this experiment, I’m trying to prove that the higher reactivity metals in the metal solution will be able to replace the lower reactivity metal pieces. Also to prove the metal, magnesium, will have the highest reactivity out of the five different metals. Then I believe that after the experiment we should be able to learn which metal is reactive and be careful with them in the future time.

Variables:

The metal pieces used in the experiment.
The metal solutions used in the solution.
Control Variables:

The measurement of metal solutions for the experiment.

The temperature of the solutions in the experiment.

Size of the metal pieces.

Fair Test:

In this experiment, I would first make sure that the amount of the solution were equal, this must be measured by the measuring cylinder every time.

Also I have to make sure all the same metal are in same shape and also same mass, this would also help the experiment to be more accurate.

The next thing which have to be test before the experiment was the temperature, they temperature must remain in constant, such as all in room temperature, so the results could have be more accurate.

Last, repeat the experiment for two more times to check the results.

Prediction:

By setting everything well, I predicted that by putting the magnesium ribbon into the magnesium sulphate there would be no reaction occurs because that the metal and the metal solution are the same, but when the ribbon is put into the rest of the 4 kind of solution, it would be reacting with them and replaced the metal in the solution. So I could proved that magnesium have the highest reactivity out of all.

Also, if the temperature of the metal solution were high, the reaction will occur faster than at room temperature.

Hypothesis:

It is likely to be seen that because that “ magnesium” metal, they are group one metal, and there’s only 1 electron in their outer shells, therefore they would be very reactive. According to Encyclopedia Website (1), I have discovered the reactivity series of the metal I used in the experiment, magnesium were the highest of all.

Also, according to information in “ New Chemistry for You, by Lawrie Ryan,” (2) I have notice that the higher the temperature, the reaction of the metal and metal solution will increase.

Method:

Apparatus:

Safety goggles
Small piece of Copper (5 total)
Small Iron nails (5 total)
Small piece of Lead (5 total)
Small Magnesium ribbons (5 total)
Small piece of Zinc (5 total)
Measuring Cylinder
Test tubes
Test tube rack
Magnesium sulphate solution
Copper (II) nitrate solution
Iron (II) sulphate solution

Lead nitrate solution

Zinc nitrate solution

Procedure:

Prepared all the apparatus that needed.

Measure 10ml of magnesium sulphate solution and pour them into the tubes.

Measure the other 4 different solutions and pour them into the other test tubes.

Make sure to label the test tubes so won’t get mix up.

Put magnesium ribbons into the 5 different test tubes.

Wait and see the reaction happens and record down the results.

Take out the metal and see the changes (shapes, colours...)

Make the symbol equations at the end.

Follow the same procedure and put the other 4 kind of metals into the solution.

Repeat the experiment again.

Measurement:

In the experiment we have to make sure the solution in the test tubes were measured by measuring cylinder every time and is accurately 10ml. This could help the results to be as accurate as possible.

Also, I would try to keep the metal piece in same shape and size, if the metal piece size were too different, it would be some differences in the results I get.

Safety rules:

Wearing safety goggles can protect our eyes from getting damage.
Beware of the solution, do not taste them or spread them around.
When reaction occurs the test tube will be hotter, do not hold them until they finish reacting.
Obtaining

Observations:

In this experiment, I first set up all my apparatus by following the procedure. Then I measure the metal solution and check if they are all in 10ml in the test tubes. Then I put the magnesium ribbon into the Magnesium sulphate solution, nothing happen, so I say it there’s no reaction occurs at all because there is no change in both metal and solution.

When I put the magnesium ribbon into the Zinc nitrate solution, lots of bubbles appear on the surface of the solution, and then zinc crystals appears and stick on the magnesium ribbon. So I can tell that magnesium have replaced zinc in this reaction.

Then when I put the ribbon into Iron (II) sulphate solution, the bubbles appear to the surface of the solution even faster than the previous test. Also Iron crystals have formed on the ribbon, the colour changed from silver to black, so I could tell that magnesium have replaced Iron in the solution.

The next test is putting the magnesium ribbon into Lead nitrate solution, bubbles were appearing slowly, it also changes the silver ribbon into black

powder and formed lead crystals, this happen because magnesium have replaced lead.

When I test it with Copper (II) nitrate, the colour of solution changes to blue and copper crystal formed on the ribbon. So I say that copper have been replaced by magnesium.

Then I did my second testing with Zinc piece, I first drop it in the Magnesium sulphate, there is no reaction occurred, there is no change in either colour or the size of the metal and solution.

When I put zinc metal into the Zinc nitrate, no reaction occurred as well, I think this is because both metal and metal solution have the same “ metal”, so they can’t replaced each other.

The next test I do was putting zinc piece into Iron (II) sulphate, the iron crystal have formed, and changed the colour to light silver. This is because that the zinc has replaced iron in the solution. After I take out the metal and put it into water, the water changes from clear to yellow.

When I put zinc piece into Lead nitrate, the zinc become black in colour, I could tell that there’s reaction happened, the zinc have replaced the lead.

The last test was to put zinc into Copper (II) nitrate, the metal have become grey, so I can tell that zinc have replaced copper in the solution, after I take the metal out and put it into clear water, the water become cloudy.

The next test was to use Iron nail, I put Iron nail into Magnesium sulphate, Zinc nitrate, and Iron (II) sulphate, there were no reaction occurred at all, I

can tell this because iron have lower reactivity than magnesium and zinc, and it can’t replaced itself, so there can’t be a reaction happened.

When I put the Iron into the Lead nitrate, the test tube warmed up, and lots of bubbles formed, also the colour of the solution changes to yellow. And lead crystals were formed, and changes iron nail from grey colour to black.

When I put iron nail into Copper (II) nitrate, I first warm the solution up to help the reaction to occurs faster, it have bubbles appeared on the surface of the solution, I could say iron have replaced the copper in the solution, and the nail changes colour to lighter grey.

The next test I do is for lead, it only have reaction with Copper (II) nitrate, there were no reaction occurred at all for the other four solutions, I could tell this because lead have a very low reactivity series. When I put the lead into the solutions, bubbles appear slowly, and copper crystal formed and changes the colour to black.

The last test is about copper, there were no reaction occurred at all in all the metal solutions, so I could say that copper have the lowest reactivity out of all these 5 metals, so therefore reaction can’t be occurs.

Results Observations:

Magnesium Ribbon – Silver colour

Magnesium Sulphate

No reaction occurred.

Zinc Nitrate

Lots of bubbles appear on the piece of metals, and the zinc crystal formed, because that magnesium has displaced the zinc in the solutions, after the reaction occurred.

Iron (II) Sulphate

Were lots of bubbles give out fast, the iron crystal have formed because the magnesium have displaced iron in the solutions, because it was more reactive, it change its colour from silver to black.

Lead Nitrate

Bubbles were appearing slowly, it changed its shape to powder, and it was formed of the lead crystal, because the magnesium replaced the lead in the solutions, the colour changed to black.

Copper (II) Nitrate

The colour changed to blue, and copper crystal was formed, because the magnesium has replaced the copper in the solution, that means reaction occurs.

Zinc – silver colour, round shape

Magnesium Sulphate

No reaction occurred.

Zinc Nitrate

No reaction occurred.

Iron (II) Sulphate

The iron crystals were formed, because the zinc displaced the iron, and it changed its silver to even lighter colour. After the zinc was dropped to water, the water changes to light yellow colour.

Lead Nitrate

Lead crystal were formed, zinc became black colour after the reaction.

Copper (II) Nitrate

Zinc displaced copper, and then copper crystals were formed, zinc became grey colour. After I put the metals into the water, the water became cloudy.

Iron nail – grey colour

Magnesium Sulphate

No reaction occurred.

Zinc Nitrate

No reaction occurred.

Iron (II) Sulphate

No reaction occurred.

Lead Nitrate

I then warm it inside a beaker of warm water, and there will lots of bobbles appeared, the solution became yellow colour, lead crystals were formed, because the iron have displaced it, the nail also changed its colour to black.

Copper (II) Nitrate

I put it into a beaker of warm water, there were lots of bobbles appeared, copper crystal were formed, because of the displacement of iron, the colour of iron became lighter.

Lead – Silver colour

Magnesium Sulphate

No reaction occurred.

Zinc Nitrate

No reaction occurred.

Iron (II) Sulphate

No reaction occurred.

Lead Nitrate

No reaction occurred.

Copper (II) Nitrate

I then put it into the beaker of warm water, there were a bubble slowly occurs, the copper crystals were formed and it changed its colour to black.

Copper –Brown colour

Magnesium Sulphate

No reaction occurred.

Zinc Nitrate

No reaction occurred.

Iron (II) Sulphate

No reaction occurred.

Lead Nitrate

No reaction occurred.

Copper (II) Nitrate

No reaction occurred.

Analyse

Table 1: This table shows about the reaction happened with Magnesium ribbon.

Solution

Any Reaction occurs

Any bubbles

Any Colour Change

Colour change in metal

Colour Change in solution

Magnesium Sulphate

No

No

No

No

No

Zinc Nitrate

Yes

Yes

No

No

No

Iron (II) Sulphate

Yes

Yes

Yes

Silver to Black

No

Lead Nitrate

Yes

Yes

Yes

Silver to Black

No

Copper (II) Nitrate

Yes

Yes

Yes

No

Blue

Magnesium:

1. Mg + MgSO4 No Reaction

2. Mg + Zn (NO3)2 Zn + Mg (NO3) 2

3. Mg + FeSO4 Fe + MgSO4

4. Mg + Pb (NO3)2 Pb + Mg (NO3) 2

5. Mg + Cu (NO3)2 Cu + Mg (NO3) 2

Table 2: This table shows about the reaction occurred when using Zinc piece.

Solution

Any Reaction occurs

Any bubbles

Any Colour Change

Colour change in metal

Colour Change in solution

Magnesium Sulphate

No

No

No

No

No

Zinc Nitrate

No

No

No

No

No

Iron (II) Sulphate

Yes

Yes

Yes

Silver to Light Silver

No

Lead Nitrate

Yes

Yes

Yes

Silver to Black

No

Copper (II) Nitrate

Yes

Yes

Yes

Silver to Grey

No

Zinc:

1. Zn + MgSO4 No Reaction

2. Zn + Zn (NO3)2 No Reaction

3. Zn + FeSO4 Fe + ZnSO4

4. Zn + Pb (NO3)2 Pb + Zn (NO3) 2

5. Zn + Cu (NO3)2 Cu + Zn (NO3) 2

Table 3: This table shows about the reaction occurred with Iron nails.

Solution

Any Reaction occurs

Any bubbles

Any Colour Change

Colour change in metal

Colour Change in solution

Magnesium Sulphate

No

No

No

No

No

Zinc Nitrate

No

No

No

No

No

Iron (II) Sulphate

No

No

No

No

No

Lead Nitrate

Yes

Yes

Yes

Grey to Black

Yellow

Copper (II) Nitrate

Yes

Yes

Yes

Grey to light Grey

No

Iron:

1. Fe + MgSO4 No Reaction

2. Fe + Zn (NO3)2 No Reaction

3. Fe + FeSO4 No Reaction

4. Fe + Pb (NO3)2 Pb + Fe (NO3) 2

5. Fe + Cu (NO3)2 Cu + Fe (NO3) 2

Table 4: This table shows about the reaction occurred with Lead piece.

Solution

Any Reaction occurs

Any bubbles

Any Colour Change

Colour change in metal

Colour Change in solution

Magnesium Sulphate

No

No

No

No

No

Zinc Nitrate

No

No

No

No

No

Iron (II) Sulphate

No

No

No

No

No

Lead Nitrate

No

No

No

No

No

Copper (II) Nitrate

Yes

Yes

Yes

Silver to Black

No

Lead:

1. Pb + MgSO4 No Reaction

2. Pb + Zn (NO3)2 No Reaction

3. Pb + FeSO4 No Reaction

4. Pb + Pb (NO3)2 No Reaction

5. Pb + Cu (NO3)2 Cu + Pb (NO3)2

Table 5: This table shows about the reaction occurred with Copper piece.

Solution

Any Reaction occurs

Any bubbles

Any Colour Change

Colour change in metal

Colour Change in solution

Magnesium Sulphate

No

No

No

No

No

Zinc Nitrate

No

No

No

No

No

Iron (II) Sulphate

No

No

No

No

No

Lead Nitrate

No

No

No

No

No

Copper (II) Nitrate

No

No

No

No

No

Copper:

1. Cu + MgSO4 No Reaction

2. Cu + Zn (NO3)2 No Reaction

3. Cu + FeSO4 No Reaction

4. Cu + Pb (NO3)2 No Reaction

5. Cu + Cu (NO3)2 No Reaction

Evaluation

In this experiment, I have notice there were some mistakes happened. The most important one was that the metal pieces weren't all in the same size. Some were much larger compare to the rest of them, this might be the most terrible part of my results.

Also, I believed that the accuracy of the solution were very important, one of the metal pieces actually take a longer time than others to react with the metal solutions, I think this might because that test tube contained lesser solution than the rest of them.

The next mistakes I have spotted out were that the magnesium ribbon, it should be silver in colour, but because the time we used it's already reacted with oxygen, so the colour weren't silver anymore. We use the cutter to get rid of the black part; this might cause the change in shape and also the mass, so my results of magnesium can't be as accurate as possible.

The last mistakes were that the water I used for the last experiment, I have accidentally drop some solutions in it. So, it's not distilled water, is some of the solution which is very close to natural in Ph rate. This would have some affect in my final results.

And the most important part is that there weren’t enough time to redo the experiment, this is also a main problem because I can’t check if my results for first experiment were correct or not.

In my future, I believe I can do much better than this experiment, because now I have learned about the test of reactivity of the metals.

Conclusion

After the experiment, I have learned about the reactivity of metals. Some are very reactive so that we should always keep them in somewhere safe. Some lower reactive metal can be used in our life, such as iron nails, copper wires… etc.

Also, I also learned about the how we could test the solution which is either alkali or acidic. I can use the universal indicator to test with it, if the colour were closer to red, it’s acidic, if is closer to blue, its alkali.

I can now tell the reactivity of the metal, magnesium were high, than is zinc, then iron, lead, and down to copper, between them have other types of metal as well. Such as Potassium have the greatest reactivity out of all the metal elements.

Resources

1) http://en. wikipedia. org/wiki/Reactivity_series

2) “ New Chemistry for You, by Lawrie Ryan, produced by Nelson Thornes.”

3) http://www. nelsonthornes.

com/secondary/science/scinet/scinet/reaction/metals. html

4) http://www. wpbschoolhouse. btinternet. co. uk/page03/Reactivity. html