

Evaluation.

Was my experiment suitable?

My experiments enabled me to gain results, which then with the aid of calculations I could find the A_r of lithium. From this perspective you can say the experiment was suitable as I achieved this.

Were my results what I expected?

Looking at the results they do not match the expected A_r of lithium (6.9). Method 1, measuring the volume of hydrogen produced, gave the result of 19.76 (a factor of 12.86 out). Method 2, titrating the lithium hydroxide produced, gave the result of 8.65 (a factor of 1.75 out).

So looking at these results not only we can see they are out, but one method is more inaccurate than the other. The titration is far more accurate than the collecting of gas.

Comparing both methods, and recognising sources of error.

Method1.

Sources of error in the collection of gas practical were: When the lithium was weighed I had to place it on filter paper first to remove the oil from it. However I feel that not all of the oil was removed from the Li so perhaps this contributed extra mass which was not part of the Li itself.

The scales themselves were awkward to use; when I placed some paper onto the scales and zeroed it (to weigh the Li onto) the mass kept fluctuating, so I was unsure as to how precise my weighing out was.

These problems will have both contributed to a source of error- the mass of Li will have not been accurate.

The next part of the practical was particularly inaccurate. I had to place the Li into the conical flask and then place the bung onto the flask quick enough so that no gas was leaked. I think this would be virtually impossible. I also had the problem that as I tried to add the Li to the flask, some of the granules stuck to the paper which it was on (probably due to the presence of some oil). So there was a short period where I had to get this Li off the paper and into the flask which will have allowed the gas to escape considerably. For this reason I feel that 60.6 may be an anomalous result contributing to my highly inaccurate A_r for method 1.

When I came to measure the gas evolved itself, my 250 ml measuring cylinder had a small irremovable air bubble inside it. I had no choice to ignore this but again this would have affected my result. Also 250 ml measuring cylinders are only accurate to 2 ml -anything under this had to be estimated, which by its very nature lacks accuracy.

Parallax may have been a problem when gauging the volume in the 250ml measuring cylinder (it has a relatively large cross-sectional area compared to a burette). This allows for a greater % inaccuracy if you do not line your eye up correctly with the meniscus.

Method2.

Sources of error in the titration of lithium hydroxide were: because the Li was not weighed accurately (see above) this would of affected my calculations at the end.

Air bubbles in the burette will have affected the titre as will have parallax – this may have been a problem when gauging the volume in the burette (however it has a relatively small cross-sectional area compared to a 250ml measuring cylinder- so is more accurate). But if you do not line your eye up correctly with the meniscus there could be a % inaccuracy.

If different batches of acid were used this would have affected the results as well as the concentrations would have been slightly different.

Adding Li to the water may have changed the volume also, but I found I had enough to carry out my 4 titrations- just.

Another mistake was I left the funnel with which I added the acid in the burette whilst performing the titration. This may have meant extra acid may have been added during the titration.

Reliability.

I feel that my titrations were reliable as I performed repeats until I had closely matching titres. However I think method 1 was unreliable due to gas loss and in hindsight I would have performed more repeats.

Which was more accurate method 1 or method 2? Why was one more accurate than the other?

Method 2 (titration) was far more accurate than method 1. This is explained by my above reasons. Far more precise instruments were used in method 2 e.g. a burette instead of a 250ml measuring cylinder. All of my reacting chemicals will have been accounted for in the titration but there was some gas loss in method 1. But if you look at my comparisons you will see there are more serious sources of error in method 1 i.e. placing the bung onto the flask quick enough so that no gas was leaked (no gas involved in method 2) or the fact that 250 ml measuring cylinders are only accurate to 2 ml -anything under this had to be estimated, which by its very nature lacks accuracy (burettes are accurate to 0.1 ml) etc.

Ways to minimise errors, and practical adaptations to improve my experiment.

- Reliability could easily be improved for method 1 by performing more repeats (I only did this experiment once!). I feel method 2 was fairly reliable but again it could be argued that repeats could improve this further.
- On method one if you tilt the flask at an angle and place the Li inside so it is not touching the water, and then place the bung and level the tube upwards, the chemicals should mix without gas loss.
- Also making sure the Li was as pure as possible before weighing to eliminate all oil possible.
- Make sure eye is lined with the meniscus and use the smallest instrument possible (with the smallest cross-sectional area possible) to eliminate parallax.
- Use instruments with the finest possible gradations to measure volume.
- Remove the funnel whilst performing the titration. This will prevent extra acid from being added during the titration
- Use the same batch of acid. Then the concentrations will be the same.
- Air bubbles in the burette removed before titrating.