

The Reaction Between Sodium Hydroxide and  
Aluminum Foil

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## Literature Search

### Sodium Hydroxide and Aluminum Foil Experiment

The experiment consists of a solution of sodium hydroxide (NaOH) and water mixed with aluminum foil. The reaction occurs between the aluminum foil and the sodium hydroxide. The foil has a layer of hydroxide on it that prevents it from reacting with water. The sodium hydroxide removes the layer and prevents it from coming back, making so that the aluminum reacts with the water and the sodium hydroxide in the solution. When this reaction occurs, it will create hydrogen gas. This gas will be filled into a balloon and the balloon will float without it being tied shut.

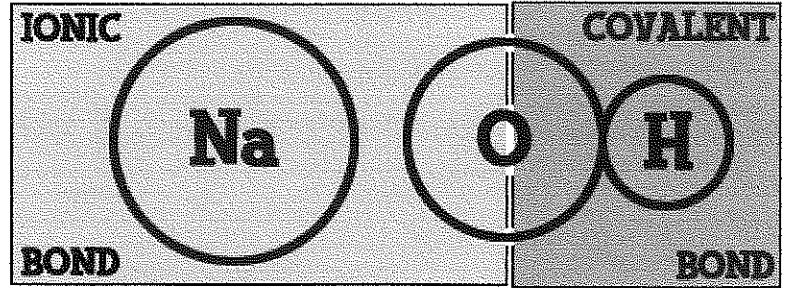
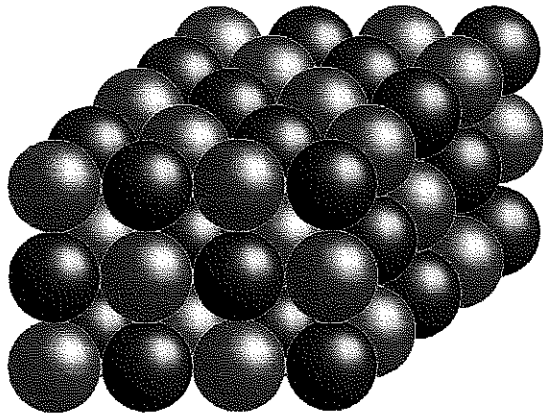
Aluminum foil is made up of aluminum alloy which is made up of 92 to 99 % aluminum. It has a thin layer of aluminum oxide to protect it from corrosion. Sodium Hydroxide is made from an ionic bond between sodium (Na) Hydrogen (H) and Oxygen (O). It contains sodium ions and hydroxide ions, making it completely ionic. It is strong base because of the hydroxide ions. It is used in the manufacturing of soaps and detergents.

Hydrogen gas is very flammable and it is used to make many compounds. It is found in water, its most familiar compound. It is the most abundant element in the universe. Hydrogen in its plasmic state is found in most stars. Hydrogen is less dense than air. Therefore when it fills the balloon, the balloon will automatically float without it being closed.



Sodium Hydroxide (left)

Structure Of NaOH



Work Cited

<http://www.madehow.com>

<http://www.bing.com/videos/watch/video/sodium-hydroxide-and-aluminium/52f7bf620acb6525735552f7bf620acb65257355-1434136609631/Volume-1/Aluminum-Foil.html>

<http://www.newworldencyclopedia.org/entry/Hydrogen>

<http://www.newworldencyclopedia.org/entry/Oxide>

<http://www.newworldencyclopedia.org/entry/Aluminum>

[http://www.newworldencyclopedia.org/entry/Sodium\\_hydroxide#Chemical\\_properties](http://www.newworldencyclopedia.org/entry/Sodium_hydroxide#Chemical_properties)

## Experimental Investigation

This experiment calls for water, aluminum foil, several balloons, <sup>materials</sup> a glass bottle, and sodium hydroxide (NaOH). Sodium hydroxide, which can be found as drain cleaner, is also known as lye and is a very basic substance. The experiment shows how mixing a solution of sodium hydroxide and water and aluminum foil causes a chemical reaction. This reaction is the creation of hydrogen gas. The steps of this procedure are as follows:

1. Make sure there are no open flames near.
2. Perform experiment outdoors.
3. Add amounts of sodium hydroxide (manipulated variable) with 1 cup of water together into a glass bottle. First add 1 tbsp. of lye, then 2 tbsp. and finally 3 tbsp. <sup>how much?</sup> <sup>diff. trials?</sup>
4. Mix the two substances well. <sup>how long? be more specific</sup>
5. The solution should start to get warm.
6. Tear pieces of aluminum foil and roll into 1 gram balls. <sup>done before mix solution?</sup>
7. Place 3 balls of aluminum foil into the glass bottle.
8. Quickly seal the bottle with the balloon by placing it over the cover.
9. Watch the chemical reaction between the sodium hydroxide solution and the aluminum foil.

The basis of our experiment was: What is the reaction between sodium hydroxide and aluminum foil. We came upon this experiment on the internet and we wanted to study this reaction. We made observations, such as the aluminum foil fizzing when it is mixed with the lye solution and the gas that it forms had a distinct smell. Our hypothesis was that the aluminum foil has a certain ingredient that causes a reaction between it and the lye. The amount of sodium hydroxide is the manipulated variable in this experiment. The responding variable is <sup>Rxn Rate?</sup> <sup>amount of gas?</sup> the size of the balloon 60 seconds after the reaction occurred.

<sup>hypothesis?</sup> <sup>this</sup> → When the aluminum foil was added to the lye solution, it started to bubble. It gave off an odor and the bottle became warm. The balloon began to inflate and become warm as well. This is proof that a chemical reaction occurred between the aluminum and the lye solution.

The inflation of the balloon shows the existence of the hydrogen gas. As the literature search and other experiments showing this reaction describes, the balloon is supposed to float without the balloon being sealed. However, when the experiment was performed, the balloon

did not float. There are several possible causes for this. One cause is that the original performers of the experiment used a different amount of each ingredient in the solution. Another cause is that they used a different amount of aluminum foil. This error could mean the amount of time the solution with the aluminum foil sits needs to change or the amount of ingredients in the solution should be changed. When this procedure is demoed, these factors will be accounted for in order to achieve better results.

There are several variables in this experiment. The main manipulated variable is the amount of sodium hydroxide. The amount increases from 1 tbsp. to 2 tbsp. and finally 3 tbsp. The changing of this variable changes the amount of hydrogen produced and the intensity of the reaction between the lye and the aluminum foil. Another possible manipulated variable is the amount of aluminum foil. This would only be changed as long as the amount of sodium hydroxide remains the same. It would also be changed only to affect the amount hydrogen produced. The amount of water remains the same throughout the experiment. This amount is 1 cup.

There are several others who performed this experiment and their results are recorded online. Their experiments show the reaction between sodium hydroxide and aluminum foil by using different amounts of the lye solution. Another experiment shows the hydrogen being inflated into a balloon and igniting the balloon to show that it is hydrogen gas, since hydrogen gas is flammable.

*We found.....  
according to our  
research that.....*

Water

1 cup

1 cup

1 cup

Sodium Hydroxide

1 tablespoon

2 tablespoons

3 tablespoons

Aluminum Foil

1 gram

1 gram

1 gram

Sodium Hydroxide

1 tbsp

2 tbsp

3 tbsp

Balloon Diameter

2.5 in.

3.2 in.

4 in.

Rate of Balloon Inflation

