

## **Research for renewable energy**

### **Look at SODIUM FILE IN SODIUM FOLDER**

Electrochemical synthesis of hydrogen peroxide

Formerly inorganic processes were used, employing the electrolysis of an aqueous solution of sulfuric acid or acidic ammonium bisulfate (NH<sub>4</sub>HSO<sub>4</sub>), followed by hydrolysis of the peroxydisulfate ((SO<sub>4</sub>)<sub>2</sub>)<sub>2</sub>- which is formed

sciencelinks.jp/j-east/article/200612/000020061206A0320235.php - 7k

Synthesis of H<sub>2</sub>O<sub>2</sub> by a fuel cell reactor

An alternative route for hydrogen peroxide synthesis is by the electrochemical reduction of oxygen using a gas diffusion electrode or a packed-bed electrode. This electrochemical cell can be operated to produce alkaline or acidic solutions of hydrogen peroxide (up to 5% strength).

onsite production of hydrogen peroxide

small scale hydrogen peroxide production

ammonium dichromate

potassium chlorate

hydrogen peroxide (52-91% conc.)

potassium dichloroisocyanurate

calcium hypochlorite (>50% wgt.)

sodium chlorate

perchloric acid (60-72.5% conc.)

sodium chlorite (>40% wgt.)

potassium bromate

sodium dichloro-s-triazinetrione

electrolytic H<sub>2</sub>O<sub>2</sub> generators

small-scale, on site processes for its

oxygen reduction on a carbon cathode

Barium Sulfate settles to the bottom and Hydrogen Peroxide is drained off, then vacuum distilled to concentrate

Electrochemical process

## **Production of Hydrogen Peroxide**

**Methods of Producing Hydrogen Peroxide:**

### 1. Mix Barium Peroxide with Sulfuric Acid.

Barium Sulfate settles to the bottom and Hydrogen Peroxide is drained off, then vacuum distilled to concentrate.

### 2. Treat water with ultraviolet light.

### 3. Run electricity through water (silent or open spark method).

### 4. Bubble Ozone (O<sub>3</sub>) through cold water

## [Electrochemical methods for](#)

benzoyl peroxide, the active ingredient in many acne medication was listed

is prepared commercially by oxidation of alkyhydroanthraquinones and by electrolysis of [ammonium bisulfate](#). It can also be prepared by reaction of [barium peroxide](#) with sulfuric acid and is prepared (with [acetone](#)) by oxidation of [isopropanol](#). Hydrogen peroxide was discovered (1818) by L. J. Thenard.

## [Electrolytic production of hydrogen peroxide](#)

**electrolytic** cell for producing chlorine and basic **hydrogen peroxide**

↗ [§1910.306 Specific purpose equipment and installations](#)

... **production of** aluminum, cadmium, chlorine, copper, fluorine, **hydrogen peroxide**, ... protection **of electrolytic** cell  
DC process power circuits need not comply with ...

[www.complianceregs.com/29cfr/1910/subS/1910-306.html](http://www.complianceregs.com/29cfr/1910/subS/1910-306.html) -  
21k -

[Cached](#)

How to collect gases

[Gas diffusion electrodes](#)

[How to build an electrolytic cell](#)

hydrogen gas diffusion anode

electrolytic cell capable of producing hydrogen peroxide

- Steven P. Webb, et al., "Generation of Hydrogen Peroxide in a Shorted Fuel Cell." The Electrochemical Society Proceedings vol. 95-26, pp. 198-208, (no date).
- Pallav Tatapudi, et al., "Simultaneous Synthesis of Ozone and Hydrogen Peroxide in a Proton-Exchange-Membrane Electrochemical Reactor." J. Electrochem. Soc., vol. 141, No. 5, May 1994, pp. 1174-1178.
- P.C. Foller, et al., "Processes for the production of mixtures of caustic soda and hydrogen peroxide via the reduction of oxygen." Journal of Applied Electrochemistry vol. 25, 1995, pp. 613-627.
- PCT Notification of Transmittal of International Search Report (PCT/ISA/220) and PCT International Search Report dated Feb. 21, 2002 (Form PCT/ISA/210) (both in German).

Applied Electrochemistry

### a Proton-Exchange-Membrane Electrochemical Reactor

The chemical way to look at redox processes is that *the reductant transfers electrons to the oxidant*. Thus, in the reaction, the **reductant** or *reducing agent* loses electrons and is **oxidized** and the **oxidant** or *oxidizing agent* gains electrons and is **reduced**. The pair of an oxidising and reducing agent that are involved in a particular reaction is called a **redox pair**.

on-site production of hydrogen peroxide

### **Electrolytic cell and process for the production of hydrogen peroxide solution and hypochlorous acid**

The electrolytic production of hydrogen peroxide making best use of the advantage of the electrolysis process has been studied and commercially practiced.

This electrolysis process allows on-site production of hydrogen peroxide,

With respect to the on-site electrolytic production of hydrogen peroxide, if seawater is used as an electrolyte, seawater containing hydrogen peroxide is obtained.

## Hoffman Electrolysis Apparatus

the electrolysis of water

(**Applied Electrochemistry**)

journal of the **Electrochemical Society**, Vol. 141, 174- (1994), proposes a method which comprises electrolysis of purified water as a starting material using an ion exchange membrane wherein ozone and hydrogen peroxide are synthesized at the anode and the cathode, respectively. However, this method has a low current efficiency and thus is not practical

electrolysis of seawater

electrolytic cell..

<http://labs.timistry.net/>

Electrolytic Technologies

## **Sodium hypochlorite manufacturing process**

Another useful product generated by the [electrolysis](#) of weak brine is **sodium hypochlorite**, otherwise known as "bleach." Sodium hypochlorite cells generally do not require [saturated](#) brine, but can utilize weak brine or even seawater. Bleach is produced "on-site" **for disinfection of drinking water and**

wastewater. The cells employed for this purpose are the same as those used for chlorate manufacture, that is, they consist of an anode and a cathode without a separator or diaphragm. The anodic and the cathodic reactions are the same as in chlor-alkali and chlorate cells, the difference being the pH of the electrolyte, which is maintained in the range of 10 to 12. The electrolytically generated chlorine reacts with sodium hydroxide to form sodium hypochlorite. However, the hypochlorite ion, formed in the bulk, is easily reduced at the cathode to reform chloride. Therefore, only dilute solutions of bleach can be produced in the cell. Hypochlorite can also react further to form chlorate, but this can be minimized by keeping the solution basic and the temperature low (close to room temperature).

There are several manufacturers of seawater electrolysis cells in the market. The best known cells include Seachlor made by DeNora (producing 1000-2500 ppm active chlorine) or Salinec made by Exceltec International Corporation (generating 200-300 ppm active chlorine). Look at **electrosynthesis of brine**

Designing Electrochemical Cells

## **Electrolysis Apparatus**

Water Electrolysis Apparatus

Sodium chlorite

[http://en.wikipedia.org/wiki/Sodium\\_chlorite](http://en.wikipedia.org/wiki/Sodium_chlorite)

Electrochemically

There's a small California company called A New View that sells a hydrogen fuel cell pickup truck and a small passenger Sedan.

## Hydrogen films

### [Gas Hydrogen from Water Electrolysis](#)

TATP is an easily synthesized, inexpensive, explosive compound that is difficult to detect by normal screening methods

've already convinced myself in the volatility of hydrogen fuel  
=D And Accidentally built a **few hydrogen bombs when screwing** around with various release valves XDD

A small-scale and low-cost apparatus for **the electrolysis of water**

P.-O. Eggen and L. Kvittingen, Journal of Chemical Education, Vol, 81, No. 9, pp 1337-1338, September 2004.

How to offer the optimal demonstration of **the electrolysis of water**

R.E. Zhou, Journal of Chemical Education, Vol. 73, No. 8, pp 786-787, August 1996

Regulated power for electrochemistry (**power supply for electrolysis, electroplating, etc**)

E. Barrow, Electronics Now, Vol. 66, No. 12, pp 29-30 and 64-68, December 1995.

[http://en.wikipedia.org/wiki/Sodium\\_chlorite](http://en.wikipedia.org/wiki/Sodium_chlorite)

### ***Inorganic electrolytic processes***

[Electrogenerated hydrogen peroxide: from history to new opportunities](#) (D. Pletcher, Electrosynthesis Co.)

<http://www.electrosynthesis.com/news/m7watts.html>

[Electrochemical ozone production, electrochemistry and green chemical processes](#)

- [Brine electrolysis, chlorine/caustic, hypochlorite, chlorate](#) (T.V. Bommaraju, P.J. Orosz, Process Technology Optimization) <http://electrochem.cwru.edu/ed/encycl/art-b01-brine.htm>

- [Electrochemists enlisted in war on global warming: the carbon dioxide reduction battle](http://www.electrochem.org/dl/interface/spr/spr01/IF3-01-Pages32-36.pdf) (D.A. Tryk and A. Fujishima, ECS Interface)  
http://www.electrochem.org/dl/interface/spr/spr01/IF3-01-Pages32-36.pdf
- [Responding to a harsh business environment: a new diaphragm for the chlor-alkali industry](http://www.electrochem.org/dl/interface/wtr/wtr03/IF12-03-Pages34-39.pdf) (S. Ahmed and P. Foller, ECS Interface)  
http://www.electrochem.org/dl/interface/wtr/wtr03/IF12-03-Pages34-39.pdf
- [Chlorates and perchlorates](http://www.geocities.com/CapeCanaveral/Campus/5361/chlorate/chlorate.html)  
http://www.geocities.com/CapeCanaveral/Campus/5361/chlorate/chlorate.html
- [Chlorate and perchlorate manufacturing on a small scale](http://huizen.dds.nl/~wfvissier/EN/kclox_EN.html) (Wouter Visser)  
http://huizen.dds.nl/~wfvissier/EN/kclox\_EN.html
- [Recycling chlorine from hydrogen chloride: a new and economical electrolytic process](http://www.electrochem.org/dl/interface/fal/fal98/IF8-98-Pages32-36.pdf) (S. Motupally et al., ECS Interface)  
http://www.electrochem.org/dl/interface/fal/fal98/IF8-98-Pages32-36.pdf
- [Desalination by electrodialysis](http://www.serve.com/damien/home/solarweb/desal/electrodialysis.html) (Damian of Hermetech)  
http://www.serve.com/damien/home/solarweb/desal/electrodialysis.html
- [Hydrogen, commercial electrolytic production of](http://www.stardrivedevice.com/electrolysis.html) (Archer Enterprises)  
http://www.stardrivedevice.com/electrolysis.html
- [Hydrogen, electrolytic production of](http://www.nrel.gov/docs/fy04osti/36734.pdf) (J. Ivy, NREL)  
http://www.nrel.gov/docs/fy04osti/36734.pdf
- [Hydrogen from water electrolysis: the basis for a solar-hydrogen economy](http://www.nmsea.org/Curriculum/7_12/electrolysis/electrolysis.htm) (New Mexico Solar Energy Association)  
http://www.nmsea.org/Curriculum/7\_12/electrolysis/electrolysis.htm

- [Hydrogen production from fossil fuels with high temperature ion conducting ceramics](http://www.electrochem.org/dl/interface/fal/fal04/IF8-04-Pages32-37.pdf) (E.D. Wachsman and M.C. Williams, ECS Interface)  
http://www.electrochem.org/dl/interface/fal/fal04/IF8-04-Pages32-37.pdf
- [Solar hydrogen production by electrolysis](http://www.dangerouslaboratories.org/h2homesystem.pdf) (W. Pile, et al.)  
http://www.dangerouslaboratories.org/h2homesystem.pdf
- [Electrogenerated hydrogen peroxide: from history to new opportunities](http://www.electrosynthesis.com/news/m7watts.html) (D. Pletcher, Electrosynthesis Co.)  
http://www.electrosynthesis.com/news/m7watts.html
- [Electrochemical ozone production, electrochemistry and green chemical processes](http://www.scielo.br/pdf/qn/v26n6/a17v26n6.pdf) (L.M. da Silva et al., U. of Sao Paulo, Brazil)  
http://www.scielo.br/pdf/qn/v26n6/a17v26n6.pdf
- [Electrochemical production of potassium ferrate](http://es.epa.gov/ncer/sbir/success/pdf/electrochemical.pdf) (Lynntech, Inc.)  
http://es.epa.gov/ncer/sbir/success/pdf/electrochemical.pdf
- [Electrochemical salt splitting](http://www.electrosynthesis.com/news/mwatts.html) (D. Genders, Electrosynthesis Co.) http://www.electrosynthesis.com/news/mwatts.html
- [Space resource processing](http://electrochem.cwru.edu/ed/encycl/art-s01-space-proc.htm) (R. Keller, EMEC Consultants)  
http://electrochem.cwru.edu/ed/encycl/art-s01-space-proc.htm
- [Tritium, electrolytic production](http://lenr-canr.org/acrobat/StormsEelectrolyt.pdf) (E. Storms and C. Talcott, LBNL) http://lenr-canr.org/acrobat/StormsEelectrolyt.pdf
- [Water electrolysis](http://chemlearn.chem.indiana.edu/demos/electropl.htm) (Indiana U.)  
http://chemlearn.chem.indiana.edu/demos/electropl.htm
- [Electrolysis of water](http://www.chem.uiuc.edu/clcwebsite/elec.html) (University of Illinois, Urbana)  
http://www.chem.uiuc.edu/clcwebsite/elec.html
- [Applications of DIACHEM<sup>®</sup> electrodes in electrolytic water treatment](#) (M. Fryda et al., ECS Interface)



<http://www.electrochem.org/dl/interface/spr/spr03/IF3-03-Pages40-44.pdf>

[Guide to \*\*electrochemical technology\*\* for synthesis, separation and pollution control](http://www.electrochem.org/dl/interface/spr/spr03/IF3-03-Pages40-44.pdf) (D. Pletcher, U. of Southampton)

<http://www.electrosynthesis.com/pdf%20files/Guide%20To%20Electrochemical%20Technology%20May%202004.pdf>

[Electro-etching or Galvanography for printmaking](http://www.greenart.info/galvetch/greenpnt.htm) (C. Green)

[Marine battery technologies, a comparison](http://www.vonwentzel.net/Battery/S)

<http://www.vonwentzel.net/Battery/S>

[New Horizons in Electrochemical Science and Technology](http://www.nap.edu/books/0309037352/html/index.html) A 163 pages long report of the National Research Council (1987). Available on-line.

<http://www.nap.edu/books/0309037352/html/index.html>

Do a quick search on google for **the 'Down's Cell'**. There are plenty of sites which have very detailed explanations and diagrams of how **molten sodium chloride is separated into sodium metal and chlorine gas.**

**Sodium from it compounds.. sodium hydroxide, sodium carbonate..then to sodium Peroxide via heating in air then with diluted acid to H<sub>2</sub>O<sub>2</sub>.**

On sciencemadness there is a lot of info on this subject.

Want to wonder? See <http://www.oelen.net/science>

**MySpace URL:**

<http://www.myspace.com/buckminsterfullerene>

I am very interested in chemistry especially in the sector of electrochemistry and chemical engineering....

A young kid who has apost on one of the chemistry forums.

### **Electromagnetism:**

[An electric motor in 10 minutes](#)

[Fun with High Voltage](#)

[A 10 minute railgun](#)

[A 30 second motor](#)

### **Electrochemistry:**

[A plastic hydrogen bomb](#)

[Building your own solar battery.](#)

[Building a Hydrogen Fuel Cell.](#)

I believe you can get some nice thick carbon electrodes from [www.unitednuclear.com](http://www.unitednuclear.com), or you can try a welding shop. They usually have some available.

## **Re:homemade hoffman apparatus (electrolysis of water)**

<http://www.scitoys.com/scitoys/scitoys/echem/echem.html>

Hi,

The best electrode i have found is **316 stainless steel**, in **potassium hydroxide** only (NOT draino etc!) the other materials just get eaten away. there is alot of misleading project information on the net.

I have done substantial testing but dont claim to be an expert - yet! - visit my webpage here:

<http://pulse8.i8.com/h2o.htm>

I have decided to post my hydrogen/oxygen gas project and results to that others in this area may benefit from it. Also learn how why and what not to do...

My current project 3 is underway, and I hope to update when finished.

thanks, let me know if it is helpful, so that I may judge interest and keep inspired to update more.

tony

A question I have is how did you determine you have pure potassium hydroxide solution from the filtration of wood ashes. One wonders if there are also other soluble inorganic and organic molecules in the solution. In any case I guess it makes no difference if the impurities have no effect on the electrodes or the gas production.

**vacuum distilled to concentrate** >>what is vacuum distillation

## References

- *Chemistry of the Elements*, N.N. Greenwood and A. Earnshaw, Pergamon Press, 1984.
- *Kirk-Othmer Concise Encyclopedia of Chemistry*, Martin Grayson, Editor, John Wiley & Sons, Inc., 1985

My source for this information is *Chemistry of the Elements* by N.N. Greenwood and A. Earnshaw, Pergamon Press (1984) -- a standard reference I recommend that every chemistry teacher buy

The most notorious of these boxes is the blue box.!

## [electrochemistry - Science Forums, The Original](#)

**electrochemistry** Inorganic Chemistry. ... You are currently viewing the **forums** as a guest, which gives you only limited access to view discussions. ...  
[www.scienceforums.net/forum/showthread.php?t=27058](http://www.scienceforums.net/forum/showthread.php?t=27058) - 38k

Generally, electrochemical methods for the synthesis of hydrogen peroxide offer some important advantages over chemical methods, including higher purity, fewer separation

steps, fewer unwanted by-products, greater safety and fewer environmental concerns.

<http://www.wipo.int/pctdb/en/wo.jsp?wo=2003010360&IA=WO2003010360&DISPLAY=DESC>

The so called Dow Process for on-site electrolytic production of hydrogen peroxide employs cathodic reduction of oxygen in a trickle bed cell. The hydrogen peroxide solution is used directly for pulp bleaching, de-inking recycled paper, etc. However, the hydrogen peroxide produced according to this method has an alkaline pH, rendering it less stable.

A clean renewable fuel that can be made from water and solar energy in any city, state or any country is a chemical compound of hydrogen and oxygen with the formula  $H_2O_2$ . Pure hydrogen peroxide is a colorless, syrupy liquid with a specific gravity of 1.44.

Hydrogen peroxide is manufactured in large amounts by the (1) electrolysis of aqueous solutions of sulfuric acid or of potassium bisulfate or ammonium bisulfate. It is also prepared by the action of acid on (2) other peroxides, such as those of sodium and barium.

It is soluble in water, and the common commercial forms are a 3% (97% water) for medical use and a 30% (70% water) for disinfecting swimming pools and Jacuzzis and 70% (30% water) for rocket propulsion, municipal water treatment and other commercial applications.

[AltFuels@USA.com](mailto:AltFuels@USA.com)

"lost wax casting" method used by artists, sculptors, and jewelers. For casting metal or plastic etc. **In the lost wax method**, a model of the finished object is

made of wax, then plaster is poured over the wax and allowed to harden. Finally, the wax is melted out of the hardened plaster, and the hollow is filled with molten metal, which cools into the same shape as the original wax model. The plaster is broken away, and the finished piece of art or jewelry is cleaned and polished. For casting an appropriate container (air tight) for a hydrogen Oxygen producer.

Acetylene + Oxygen =welding....ets.....

Sodium was first isolated by Sir [Humphry Davy](#) in 1807 by passing an electric current through molten [sodium hydroxide](#). Sodium Hydroxide **Melts at 318 C** and is decomposed into its elements at about 1300 C.

**LOOK Sodium Hydroxide from Quick Lime (Noora) and Sodium Carbonate in Making soap.**

When burned in air, sodium forms [sodium peroxide](#)  $\text{Na}_2\text{O}_2$ , or with limited [oxygen](#), the oxide  $\text{Na}_2\text{O}$  (unlike [lithium](#), the [nitride](#) isn't formed

**Sodium percarbonate** is a white crystalline water-soluble [chemical compound](#) of [sodium carbonate](#) and [hydrogen peroxide](#). It is an oxidizing agent and ingredient in a number of home and laundry cleaning products. Despite the name it is in fact a carbonate perhydrate. **Dissolved in water, it releases  $\text{H}_2\text{O}_2$  and [soda ash](#) (sodium carbonate):**

Other Oxidizers:

usually **65% calcium hypochlorite** using it directly (try it) **or look file to chlorate.** From mixing with NaCl (simple)

Many privately funded rocket companies are using hydrogen peroxide, notably [Blue Origin](#), and some amateur groups have **expressed interest in manufacturing their own peroxide,** for their use and for **sale in small quantities to others.**

Many amateurs try [distillation](#), vacuum distillation. Other approaches for [concentrating hydrogen peroxide](#) are [sparging](#) and [fractional crystallization](#).

### **Melting point of NaCl is 800 C ... for Na<sub>2</sub>O<sub>2</sub>**

When producing sodium chlorate or Potassium chlorate via Calcium Hypochlorite heating with K or Na salts CaCl is produced as a chalky persepate...it can be used in lowering NaCl melting .

Some [calcium chloride](#) and/or [sodium carbonate](#) is added to the electrolyte to reduce the temperature required to keep the electrolyte liquid. Sodium chloride normally melts at 804 °C, but the mixture can be kept liquid at temperatures around 600 °C.

Chemicals used in de-icing salts are mostly found to be [sodium chloride](#) (NaCl) or [calcium chloride](#) (CaCl<sub>2</sub>). Is used in deicing roads.

Look at hydrogen bomb from water electrlysis .  
scitoys.com

**The Plastic Hydrogen Bomb** uses electricity to break apart water molecules into hydrogen and oxygen. Then it uses a spark of electricity **to explosively** recombine the gases into high pressure steam, which propels a stream of water high into the air.

Next, remember that in stronger concentrations [\(anything over around 6% solutions\)](#) it is a **bleaching agent**. So, rather than using stronger concentrations for cleaning, simply allow standard 3% solution to work for a few minutes to achieve cleaning without any bleaching effect.

**Dry formulation hydrogen peroxide** is sold as sodium percarbonate powder or granules. It is the basis for many "oxygen cleaners" such as

"OxyClean", "OxoBrite" and others in the marketplace, where it is **normally a 70 to 74% sodium percarbonate mix with soda ash, or "sal soda"**. However, for full strength bleaching, look for **pure sodium percarbonate**, which can be found for sale on-line at places like thechemicalstore.com and a few others.

it can be manufactured easily using electrochemical processes.  
Hydrogen peroxide

One of the first things that **Louis Thenard** found out about hydrogen peroxide was that it attacks the skin, producing painful blotches.

In late 1818, he finally succeeded in **preparing pure hydrogen peroxide**, which he called "oxygenated water," and determined its density.

Although it is found in nature, small quantities of hydrogen peroxide can be made in the laboratory by reacting **barium peroxide with cold diluted sulfuric acid**. Larger amounts are produced by **electrolyzing chilled concentrated sulfuric acid**. This process causes a series of chemical reactions to occur and to create a substance called peroxy-disulfuric acid. **When the solution is warmed to room temperature, it becomes hydrogen peroxide.**

In nature, hydrogen peroxide is **created in the atmosphere** when **ultraviolet rays strike oxygen in the presence of moisture**. Ozone is free oxygen **with an extra atom of oxygen**. When **ozone comes into contact with water**, this **extra atom of oxygen splits off easily**. **Water combines with the extra oxygen atom to become hydrogen peroxide.**

## **Water Bomb:**

Put water in a beaker, insert two electrodes, connect to a DC power supply,  
>I forget which but O will bubble up one electrode and H the other one, if I  
>remember correctly 2 parts H to 1 part O hence H<sub>2</sub>O

You get hydrogen at the cathode. **The maximum bang is when you have the stoichiometric mixture so just collect the gases from both electrodes.**

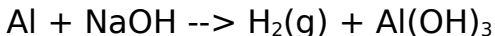
A 6 inch diameter balloon filled with the 2:1 mixture will rattle your ear drums pretty good. Standard lab demonstration is to fill several balloons. One with pure hydrogen, second with air hydrogen mixture and the last with 2:1 mix. The last one gets their attention when you fire it. A match on a long tick and ear protection is appropriate.

**Ozonation** consists of four fundamental tasks(1) drying and cleaning the oxygen-containing feed-gas;(2) generating ozone in a **silent corona discharge generator**;(3) bringing the ozone into contact with the material being treated; and finally(4) destroying remaining ozone prior to releasing the waste gas to the **atmosphere**.

Hydrogen from Aluminum: [Muriatic acid bombs](#)  
Aluminum Foil + Hot diluted HCL (Muriatic Acid)  
look films

## **Action of Sodium or Potassium Hydroxide on Aluminum:**

[Click here to see this reaction taking place](#)





Upon mixing **hydrochloric acid** with common oxidizing chemicals, such as **bleach (NaClO)** or **permanganate (KMnO<sub>4</sub>)**, the toxic gas **chlorine** is produced.

Usually **the sodium chloride** is melted in **a heated graphite vessel** which serves as one electrode. In the center the **other electrode attracts the chlorine** which is vented off

Yes. In fact, that's how **sodium hydroxide is produced** on an industrial scale. They electrolyze a very concentrated sodium chloride solution producing chlorine gas and **sodium hydroxide**.

(Or you could go to a junkyard and look for **engine valves**. Many automobile engine valves have **sodium metal in the valve stems** as it's a very good conductor of heat)

### **oxygen and acetylene into a balloon**

if you want a real bang - mix approximately equal mixtures of oxygen and acetylene into a balloon and tie the end off. Either use a petrol or gunpowder fuse, just make sure you have got enough time to get well back! For a bit of excitement, put two or three balloons under a drum, 44 gal (200L- Australia) and a chook or two, add a twenty foot petrol fuse, ignite, stand back, watch drum reach about 200' and see a very startled chook learning to fly! Good stuff!