



Clemas Study Centre

31^A Cemetery Rd Sapele

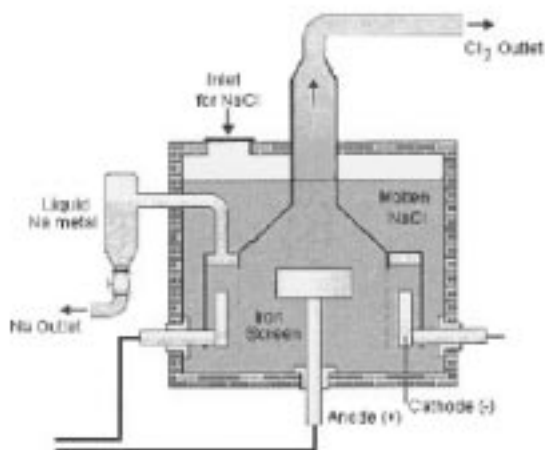
CHEMISTRY

TOPIC: SODIUM & ITS COMPOUNDS - Part I

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Sodium is a typical member of Group 1 and has the electronic configuration of $1s^2 2s^2 2p^6 3s^1$. Occurrence: It is a very reactive metal and so does not occur in its native or free state. The metal is often found in deposits of rock salt (NaCl), sodium trioxocarbonate (Na_2CO_3) as well as *Chile Saltpetre* which contains largely sodium trioxonitrate (V).

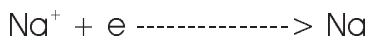
Extraction: Sodium is extracted from rock salt in what is known as the Downs Process. In this process, Downs cell is employed. The cell consists of graphite anode and steel cylinder which serves as the cathode, surrounding the anode. Sodium Chloride is used as the electrolyte and because the melting point is as high as $800^\circ C$. is electrically heated to make it molten. To ease the melting process, Calcium chloride is added to somewhat decrease the melting point from $800^\circ C$ to about $550^\circ C$.



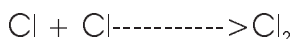
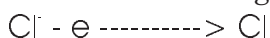
Chemistry of the Reaction:

The molten sodium chloride contains sodium and chloride ions which drift to the cathode and anode as found appropriate.

At the Cathode: Sodium ion will move to the cathode and there gains an electron each to form the metal.



At the Anode: The chloride ions, in turn, move to the anode to gain electrons to become chlorine gas



The products of the electrolysis namely sodium and chlorine are separated from each other in that the cathode and the anode are demarcated from one another by a steel wire diaphragm. The chlorine gas, which is a by-product is tapped off through the hood (as shown in the figure).

Physical Properties

1. The metal is silvery white in colour with a relative density of 0.98;
2. It is very malleable and can be sliced by a knife.
3. The melting point is about $97^\circ C$;
4. It is a good conductor of heat and electricity.

Chemical Properties

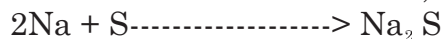
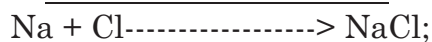
1. Sodium is very reactive and readily forms its oxide on mere exposure to air.



This explains why it is advisably stored under paraffin oil in the laboratories.

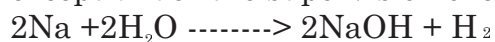
2. On heating in air, however, sodium peroxide is formed. $2\text{Na} + \text{O}_2 \text{ -----} > \text{Na}_2\text{O}_2$

3. Combination Reactions:



4. Reaction with ethanol: Sodium reacts with ethanol, vigorously to form sodium ethoxide, while hydrogen gas is given off.. Thus: $2\text{Na} + 2\text{CH}_3\text{CH}_2\text{OH} \text{ -----} > 2\text{CH}_3\text{CH}_2\text{ONa} + \text{H}_2$

5 Reaction with water: Sodium reacts very violently with water to form sodium hydroxide while hydrogen gas is released. CAUTION: Do not perform this experiment except under the supervision of a qualified Chemistry teacher.



6. Reaction with dilute acids: Sodium reacts very violently with most dilute acids to form sodium salt and liberating hydrogen gas in the process.



Uses

Sodium is used in the manufacture of very important compounds like sodamide, sodium peroxide and sodium cyanide. It is used in the making of sodium vapor lamps and also as a coolant. It serves as useful reducing agent when mixed with ethanol and amalgam.

QUESTIONS

1. Describe Downs process of extracting sodium
2. List three chemical properties of sodium and explain with well balanced chemical equations.