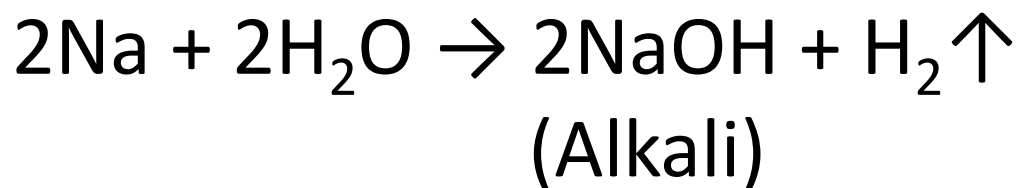


# **Chemistry, Alkali Metals**

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# Alkali Metals

The elements of group IA in the periodic table which gives alkali with water are called alkali metals. They react with water giving alkali, so, called alkali metals.



# Periodic discussion

- The alkali metals constitutes group IA of the periodic table. They are along with their electronic configuration are as follows:

- The position in the periodic table is classified by their electronic structure & resemblance and graduation of properties.

Elements	Electronic configuration	M. pt. (°C)	B. pt. (°C)
<sup>3</sup> Li	[He] 2s <sup>1</sup>	180	1347
<sup>11</sup> Na	[Ne] 3s <sup>1</sup>	98	883
<sup>19</sup> K	[Ar] 4s <sup>1</sup>	64	774
<sup>37</sup> Rb	[Kr] 5s <sup>1</sup>	39	688
<sup>55</sup> Cs	[Xe] 6s <sup>1</sup>	28	678
<sup>87</sup> Fr	[Rn] 7s <sup>1</sup>	27	677

# **General Characteristics of Alkali Metals**

## **Physical Properties**

- i] Because of their great tendency to loose electrons, alkali metals are very reactive and are not found in free state in nature.
- ii] They all are univalent and strongly electropositive. This is due to presence of single electron in the outermost shell which is easily lost.
- iii] They are all silvery white, soft, malleable, ductile and can be easily cut.

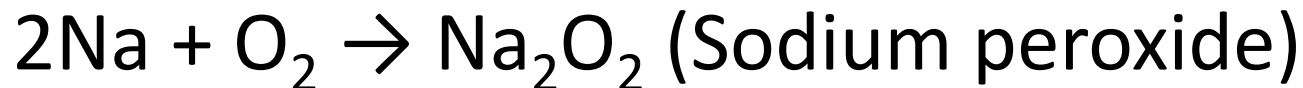
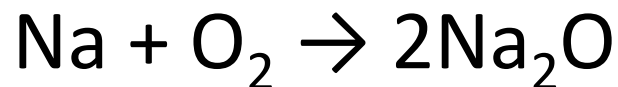
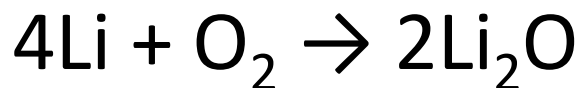
# Physical properties of Alkali metals contd..

- iv] They are light metals. Their specific gravity increases with the rise of at. wt. while there is fall in their melting and boiling points.
- v] Oxidation state - In alkali metal, there is only one  $e^-$  in their valence shell. By losing this  $e^-$ , they can acquire stable configuration of the nearest noble gas. Therefore, alkali metals exhibit +1 oxidation state in their compounds.
- $$\text{Na} \rightarrow \text{Na}^+ + e^-$$
- vi] Size of atom increases on moving down the group from Lithium to Cesium due to increase of number of shell.

# Chemical Properties of Alkali metals

## 1. Action with air

Alkali metals are tarnished when come in contact with  $O_2$ . When burn in  $O_2$ , different oxides are formed depending upon the nature of alkali metal.

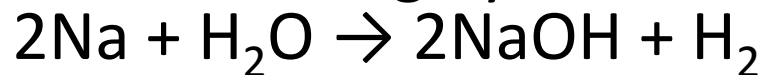


# Chemical Properties of Alkali metals

## contd...

### 2. Action with water

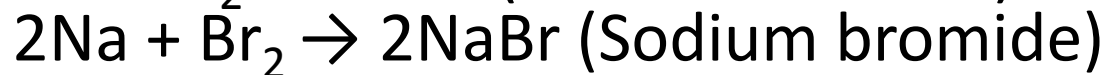
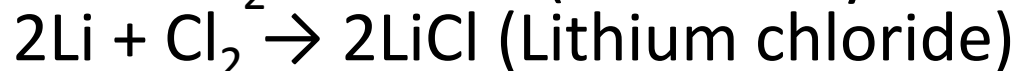
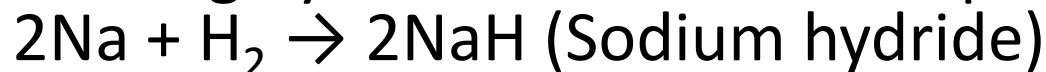
The alkali metals react very readily and strongly with water forming hydroxides.



The order of reactivity is  $\text{Cs} > \text{Rb} > \text{K} > \text{Na} > \text{Li}$

### 3. Action with hydrogen and halogens

Hydrogen and halogens react with alkali metals forming hydrides and halides respectively.



# Sodium

Sodium is the 2nd member of alkali metal family belong to group IA(1st) of Periodic table.

## Physical properties

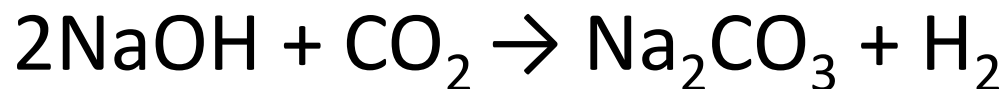
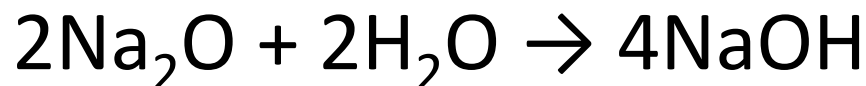
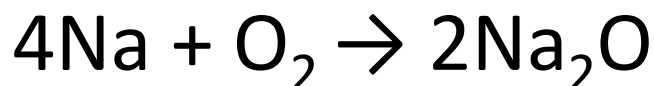
- i) Sodium possess a silvery white surface when freshly cut but the surface is tarnished (dullness) on exposure.
- ii) It is soft (it can be cut by a knife), malleable, ductile and lighter than water.
- iii) It is a good conductor of electricity.
- iv) M. pt. =  $97.5^{\circ}\text{C}$   
B. pt. =  $880^{\circ}\text{C}$



# Chemical properties

## 1. Action with air

On exposure to moist air, the surface of sodium is tarnished due to the formation of layer of sodium carbonate.



So, it is always kept under kerosene oil.

# Chemical properties of Sodium contd..

## 2. Action with water

It reacts violently with water forming caustic soda and evolving H<sub>2</sub> gas.



## 3. Action with acids

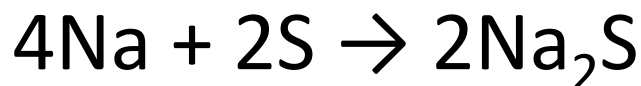
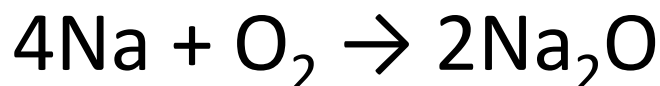
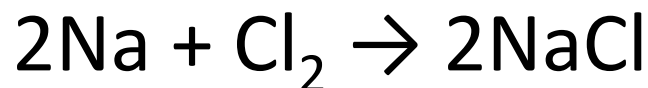
It gives hydrogen gas with acid violently which burns itself.



# Chemical properties of Sodium contd..

## 4. Action with Non-metals

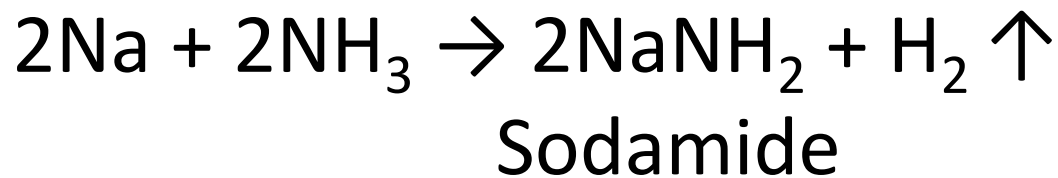
It reacts with halogens, oxygen, sulphur directly giving sodium halide, sodium oxide and sodium sulphide respectively.



# Chemical properties of Sodium contd..

## 5. Action With NH<sub>3</sub>

Sodium dissolves in NH<sub>3</sub>, giving a blue solution. When heated with NH<sub>3</sub> gas around 200 to 300°C, Sodamide is formed along with H<sub>2</sub>.

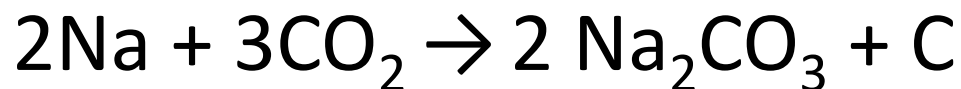


# Chemical properties of Sodium

## contd..

### 6. Action With CO<sub>2</sub>

Sodium burns in the atmosphere of CO<sub>2</sub> giving sodium carbonate, and carbon is set free.



### 7. Reducing Action

Sodium is a powerful reducing agent. It reduces Silicon dioxide to silican.



# Chemical properties of Sodium contd..

## 8. Amalgam Formation

Sodium forms alloy with potassium which is liquid at ordinary temperature. Na also forms **alloy** with Hg forming **Sodium amalgam** which is widely used as a reducing agent in presence of acid.

# Uses of Sodium

- i) Na is used in sodium vapour lamp which gives yellow light, and used to illuminate the streets.
- ii) Sodium as well as Sodium amalgam are used as reducing agents in organic synthesis.
- iii) It is also used in extraction of boron and silican.
- iv) Liquid sodium or its alloy with potassium is used as a coolant in nuclear reactors.
- v) It is used in drying organic solvents such as benzene, to remove even last traces of moisture.
- vi) It is used as reagent in the detection of nitrogen, sulphur and halogens in organic compounds.