



Sodium hydroxide, commonly known as caustic soda or lye, is a highly caustic and corrosive inorganic compound. It is widely used in various industrial processes, including the manufacture of paper, textiles, and detergents, as well as in water treatment and chemical synthesis. Sodium hydroxide is known for its strong basic (alkaline) properties and is a key ingredient in many chemical reactions and products.

Chemical Properties

1. Structure:

- Sodium hydroxide is an ionic compound composed of sodium (Na^+) cations and hydroxide (OH^-) anions.
- The hydroxide ion is responsible for its strong basicity, while the sodium ion balances the charge, making it a neutral compound overall.

2. Solubility:

- Sodium hydroxide is highly soluble in water, dissolving readily to form a strongly alkaline solution. The dissolution of NaOH in water is exothermic, meaning it releases a significant amount of heat.
- It is also soluble in ethanol and methanol but is insoluble in non-polar solvents like ether.

3. Basicity:

- Sodium hydroxide is a strong base, meaning it completely dissociates into sodium ions (Na^+) and hydroxide ions (OH^-) in water. This complete dissociation results in a high pH, typically around 14 for concentrated solutions, making it extremely alkaline.
- The hydroxide ions are highly reactive and can neutralize acids, forming water and a corresponding salt. This reaction is fundamental to many of its applications in industry and laboratory settings.

4. Reactivity:

- Sodium hydroxide is highly reactive, especially with acids and acidic compounds. When it reacts with acids, it forms water and a salt in a neutralization reaction. For example, reacting NaOH with hydrochloric acid (HCl) produces sodium chloride (table salt) and water:
$$\text{NaOH} + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O}$$