



SNS COLLEGE OF TECHNOLOGY



AN AUTONOMOUS INSTITUTION

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COIMBATORE

DEPARTMENT OF CIVIL ENGINEERING

19CEB201 – CONSTRUCTION MATERIALS

II YEAR / III SEMESTER

Unit 2 : Lime – Cement – Aggregates

Topic 1 : Lime, Lime Mortar



Lime

- **Lime** is a calcium containing inorganic material composed primarily of oxides, and hydroxide, usually calcium oxide and/ or calcium hydroxide.
- These materials are still used in large quantities as building and engineering materials (including limestone products, cement, concrete and mortar).
- The rocks and minerals from which these materials are derived, typically limestone or chalk, are composed primarily of calcium carbonate.
- They may be cut, crushed, or pulverized and chemically altered.



Lime





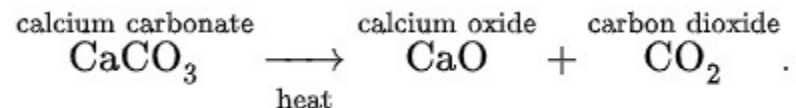
Lime

- Burning (calcination) of these minerals in a lime kiln converts them into the highly caustic material burnt lime, unslaked lime or quicklime (calcium oxide) and, through subsequent addition of water, into the less caustic (but still strongly alkaline) slaked lime or hydrated lime (calcium hydroxide, $\text{Ca}(\text{OH})_2$), the process of which is called **slaking of lime**.



Lime - Production

- In the lime industry, **limestone** is a general term for rocks that contain 80% or more of calcium or magnesium carbonate, including marble, chalk, oolite, and marl.
- Limestone is extracted from **quarries or mines**.
- Part of the extracted stone, selected according to its chemical composition and optical granulometry, is calcinated at about 1,000 °C (1,830 °F) in different types of lime kilns to produce quicklime according to the reaction:





Lime - Production

- Before use, quicklime is hydrated, that is combined with water, called slaking, so hydrated lime is also known as slaked lime, and is produced

according to the reaction:
$$\text{CaO} + \overset{\text{water}}{\text{H}_2\text{O}} \longrightarrow \overset{\text{calcium hydroxide}}{\text{Ca}(\text{OH})_2} .$$

- *Dry slaking* is slaking quicklime with just enough water to hydrate the quicklime, but to keep it as a powder; it is referred to as hydrated lime.
- In *wet slaking*, a slight excess of water is added to hydrate the quicklime to a form referred to as lime putty.
- Because lime has an adhesive property with bricks and stones, it is often used as binding material in masonry works.
- It is also used in whitewashing as wall coat to adhere the whitewash onto the wall.



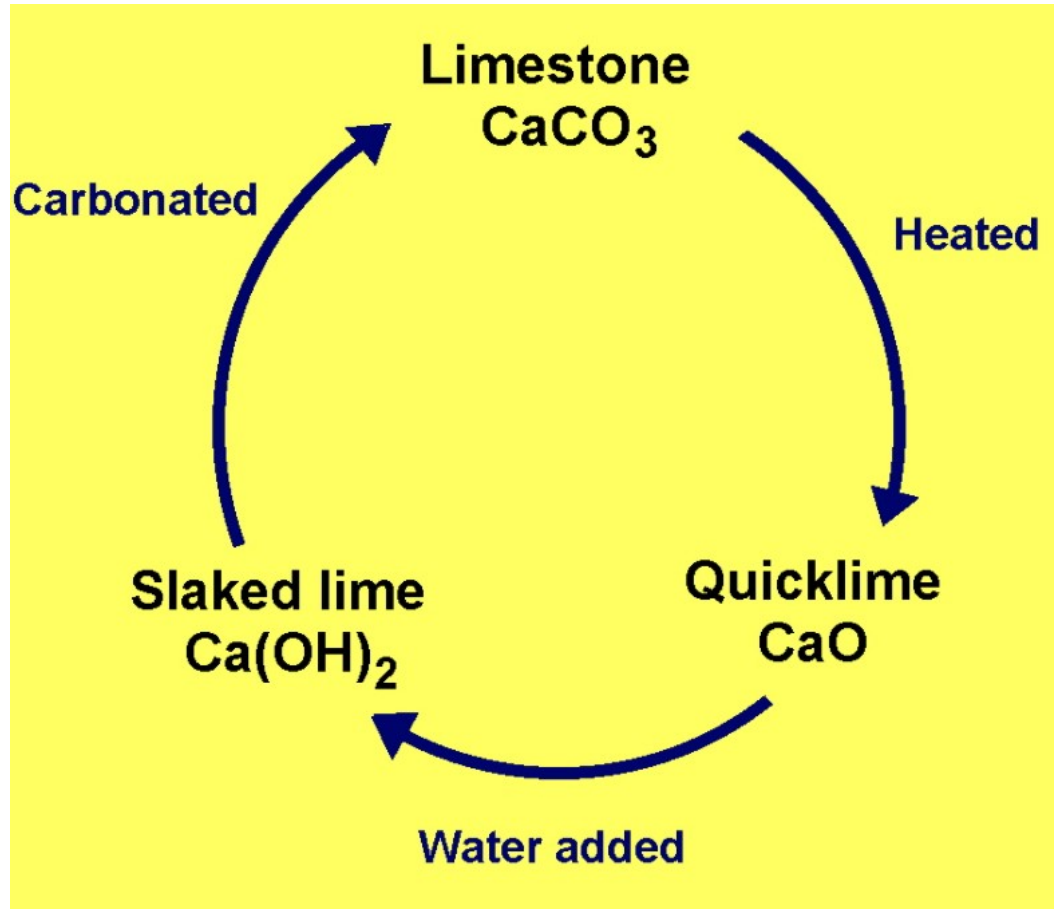
Lime - Cycle

- The process by which limestone (calcium carbonate) is converted to quicklime by heating, then to slaked lime by hydration, and naturally reverts to calcium carbonate by carbonation is called the *lime cycle*.
- When the masonry has been laid, the slaked lime in the mortar slowly begins to react with carbon dioxide to form calcium carbonate (limestone) according to the reaction:





Lime - Cycle





Mortar

- Mortar is one of the oldest building materials, used to allow large structures to be constructed from small, easy-to-handle components such as bricks, blocks and stones.
- It is composed from a mixture of a fine aggregate, a binder and water.
- This combination creates a paste that is used in masonry construction as a bedding and adhesive to bind and fill the gaps between adjacent blocks.
- In modern construction, the fine aggregate is typically sand, and the binder cement. This is known as a **cement mortar**.
- However, if lime is used as the binder, this is known as **lime mortar**.



Mortar





Lime Mortar

- Lime mortar has been used in construction since the time of the ancient Egyptians around 4,000 to 6,000 BC.
- It continued to be used until the 19th century, when the introduction of Portland Cement led to the emergence of cement mortars, which were faster setting and had a higher compressive and flexural strength.
- The word lime is derived from the Old English lime, meaning 'sticky substance' and the root, lei relating to slime or slimy.
- It obtained this name because it has a very fine particle size, finer than cement, and so is able to penetrate smaller 'holes' in the materials it is binding.



Lime Mortar

- It then tends to bind them more ‘gently’, as it is more flexible and gives earlier adhesion, but then gains strength more slowly than cement mortars.
- Lime mortar also remains workable for longer than cement mortar, even when used with absorbent masonry, and so it can be easier to properly fill joints.



Thank You!!