

Calcium oxide

Calcium oxide is usually made by the [thermal decomposition](#) of materials, such as [limestone](#) or [seashells](#), that contain [calcium carbonate](#) (CaCO₃; mineral [calcite](#)) in a [lime kiln](#). This is accomplished by heating the material to above 825 °C (1,517 °F), a process called [calcination](#) or *lime-burning*, to liberate a molecule of [carbon dioxide](#) (CO₂), leaving quicklime. This is also one of the few chemical reactions known in [prehistoric](#) times.



The quicklime is not stable and, when cooled, will [spontaneously react](#) with CO₂ from the air until, after enough time, it will be completely converted back to calcium carbonate unless [slaked](#) with water to set as [lime plaster](#) or [lime mortar](#).

Annual worldwide production of quicklime is around 283 million tonnes. China is by far the world's largest producer, with a total of around 170 million tonnes per year. The United States is the next largest, with around 20 million tonnes per year.

Approximately 1.8 t of limestone is required per 1.0 t of quicklime. Quicklime has a high affinity for water and is a more efficient [desiccant](#) than [silica gel](#). The reaction of quicklime with water is associated with an increase in volume by a factor of at least 2.5

Weapon

In 80 BC, the Roman general [Sertorius](#) deployed choking clouds of caustic lime powder to defeat the Characitani of [Hispania](#), who had taken refuge in inaccessible caves. A similar dust was used in China to quell an armed peasant revolt in 178 AD, when *lime chariots* equipped with bellows blew limestone powder into the crowds.

Quicklime is also thought to have been a component of [Greek fire](#). Upon contact with water, quicklime would increase its temperature above 150 °C (302 °F) and ignite the fuel.

[David Hume](#), in his *History of England*, recounts that early in the reign of [Henry III](#), the English Navy destroyed an invading French fleet by blinding the enemy fleet with quicklime. Quicklime may have been used in medieval naval warfare – up to the use of "lime-mortars" to throw it at the enemy ships

Safety

Because of vigorous reaction of quicklime with water, quicklime causes severe irritation when inhaled or placed in contact with moist skin or eyes. Inhalation may cause coughing, sneezing, and laboured breathing. It may then evolve into burns with perforation of the nasal septum, abdominal pain, nausea and vomiting. Although quicklime is not considered a fire hazard, its reaction with water can release enough heat to ignite combustible materials.

Ecological cement

Ecological cement is a cementitious material that meets or exceeds the functional performance capabilities of ordinary Portland cement by incorporating and optimizing recycled materials, thereby reducing consumption of natural raw materials, water, and energy, resulting in a more sustainable construction material. One is [geopolymer cement](#).

New manufacturing processes for producing ecological cement are being researched with the goal to reduce, or even eliminate, the production and release of damaging pollutants and greenhouse gasses, particularly CO₂.

Growing environmental concerns and the increasing cost of fuels of fossil origin have resulted, in many countries, in a sharp reduction of the resources needed to produce cement and effluents (dust and exhaust gases).

A team at the [University of Edinburgh](#) has developed the 'DUPE' process based on the microbial activity of *Sporosarcina pasteurii*, a bacterium precipitating calcium carbonate, which, when mixed with [sand](#) and [urine](#), can produce mortar blocks with a compressive strength 70% of that of conventional construction materials.