

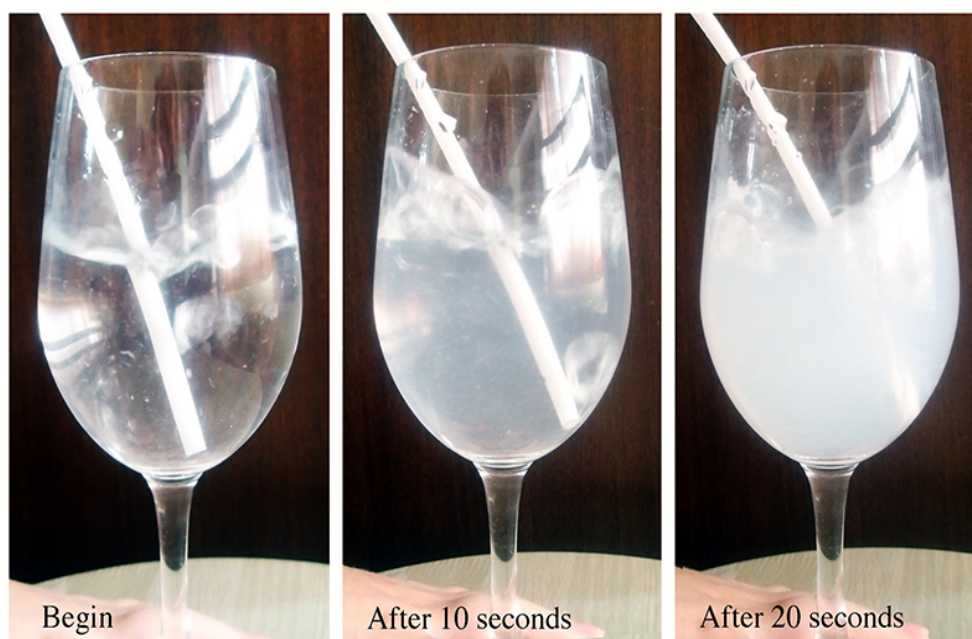
Slaked lime and mortar

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Testing for gasses

Testing for a gas in High School is normally limited to distinguishing between oxygen, hydrogen and carbon dioxide. Pure oxygen causes a glowing splint or incense stick to burst into flame, pure hydrogen burns with a sudden “pop” and pure carbon dioxide extinguishes a flame. No mystery here: provided we’re confident we have one of the trio on its own. A saturated solution of slaked lime (calcium hydroxide) is used in school chemistry to test for low levels of carbon dioxide: for instance, in exhaled air, which contains about 4% of CO_2 .

Testing for CO_2



Lime water turns “milky” as calcium hydroxide, $\text{Ca}(\text{OH})_2$, is converted to limestone powder, CaCO_3 .

Because glass is not etched by acids: the exception being hydrofluoric acid, it is used for storing most chemicals and for glazing the ceramic plates and cups on our dinner tables. Limewater has a surprising property: like a NaOH solution it will etch glass.

Saturated limewater

A saturated solution of $\text{Ca}(\text{OH})_2$ contains only a little more than one gram of dissolved hydroxide per liter. In contrast, a kilogram of crystalline NaOH (caustic soda) can be dissolved in a litre of water. Leaving a glass of saturated $\text{Ca}(\text{OH})_2$ solution overnight creates a thin crust of tiny transparent crystals of CaCO_3 on the surface of the water and adhering to the glass. The two most common crystalline forms of calcium carbonate are calcite, which has a trigonal structure with rhombohedral crystals, and aragonite, which is orthorhombic with column crystals. The crystals in the glass are probably calcite.



A large single crystal of

The crystals on the glass are in two areas, a ring at the liquid surface, and more random patches lower down next to the body of the liquid.



Aragonite crystals from Wikimedia.

Mortar

Lime mortar is a paste of a quarter slaked lime to three quarters sand. The paste hardens and adheres to bricks as it ages and the carbon dioxide in the air converts the hydroxide to the carbonate. It is thought that the etching of silica in the mortar and in the bricks by hydroxide in solution may assist in bonding the hardened mortar to the bricks.

Silica sand is on the left and our *slaked lime* is on the right.

Making lime mortar



Making a paste with water, silica sand and slaked lime.

Mortar, which must be made fresh before use, is a mixture of slaked lime, sand and water. Silica sand, which is white, is used here. The slaked lime that we made has a component of calcium carbonate and the mortar may not be satisfactory.

Building a wall



Putting together a small brick wall with fresh mortar.

The trial wall has been left for a week.



The mortar has hardened as expected but it has not stuck to the bricks. The wall can be taken apart. *We will have to think about that.*