



# Changes with water

Some substances change permanently when they are mixed with water.

Some substances will combine with water to form new, hard materials called **CRYSTALS**. Crystals form in the following way: a fine **POWDER** of the substance is mixed with water. The water and the powder combine and form a new material, which sets into long, thin, needle-like crystals. These crystals are too small to see without a very powerful microscope, but as the crystals grow and interweave, they make a strong, hard substance. Once the crystals have grown, the water cannot be removed from them.

The two most common materials of this kind are called plaster of Paris and cement.

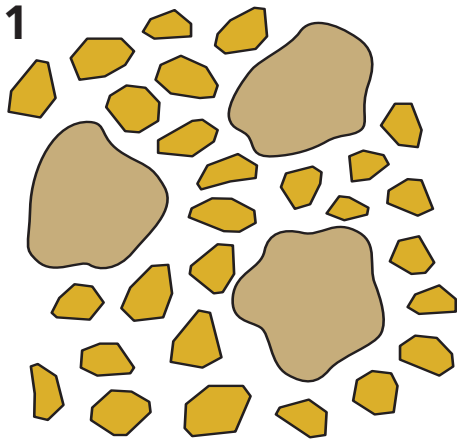
## Plaster of Paris

Plaster of Paris is a fine, white powder. It is made from crushing, and then heating, a rock called gypsum. It is used to make moulds and plaster wallboards in houses or to fill cracks in walls. It is also used to make plaster casts (Picture 1). The material used to encase a broken arm or leg is plaster of Paris.

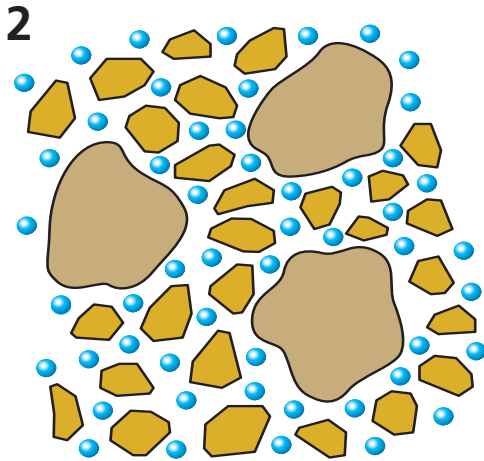


◀▲ (Picture 1)  
Plaster of Paris used  
to make a mould of  
family feet.

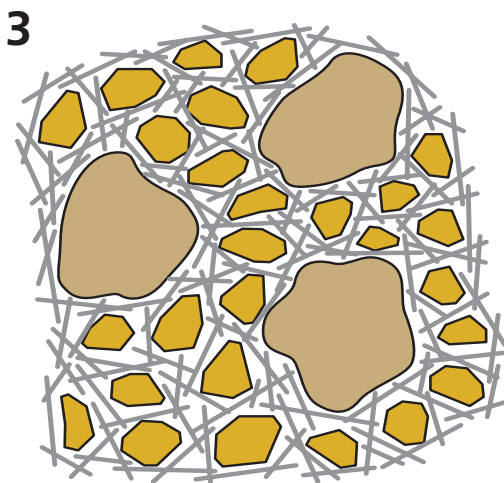
▼ (Picture 2) What happens in a concrete mix.



Sand and gravel are mixed together.



Cement and water are mixed in.



The substances in the cement combine with the water to form needle-shaped crystals which set hard and lock the sand and gravel in place.



▲ (Picture 3) A bridge being made of concrete.

## Cement

Cement is a much harder material than plaster of Paris. It is made by first grinding up limestone and clay. These materials are heated in a furnace, then ground once more. This is cement. When water is added, the cement and water combine to make interlocking crystals.

Cement is usually used to bind some other materials together. This is how it is used in concrete (Pictures 2 and 3). Concrete is made from sand, cement and small stones called gravel. These ingredients are all thoroughly mixed together and water is added.

Because the cement has been mixed in with the sand and gravel, when the cement crystals grow, they surround these materials, locking them into place.

### Summary

- Some substances combine with water to make new hard materials.
- When plaster of Paris or cement mix with water, they form interlocking crystals that are hard to break.