GOVT. POLYTECHNIC SHAHJHANPUR

SUBJECT – CHEMICAL TECHNOLOGY –II
BRANCH - CHEMICAL ENGG.
SEMESTER – 4TH
TOPIC – PLASTER OF PARIS & GYPSUM

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PLASTER OF PARIS

Plaster of Paris is a white powder which is used mainly for making toys, statues, blackboard chalk and for beautification of ceilings of buildings and houses. It is also used for the setting of fractured bones in the right position. It has got its name from the fact that it was first of all prepared from gypsum which was mainly found in Paris. In short it is also called as P.O.P

Chemical name and Chemical Formula

The chemical name of plaster of Paris is **calcium sulphate hemihydrate** because half molecule of water is attached with calcium sulphate. The chemical formula of plaster of Paris is **$CaSO_4.1/2H_2O$**.

Preparation of Plaster of Paris

Plaster of Paris is prepared by heating **gypsum ($CaSO_4.2H_2O$)** to a temperature of 373 K in a kiln. Actually the chemical name of **gypsum** is **calcium sulphate dihydrate** which means that the molecule of gypsum is in fact molecule of calcium sulphate which contains two molecules of water of crystallization. So when gypsum is heated then it loses one and half molecules of water of crystallization leaving only half molecule of water of crystallization remaining attached with calcium sulphate.

$$\underset{\text{Gypsum}}{CaSO_4.2H_2O} \xrightarrow{\text{Heat to 373K}} \underset{\text{Plaster of Paris}}{CaSO_4.1/2H_2O} + \underset{\text{Water}}{3/2\ H_2O}$$

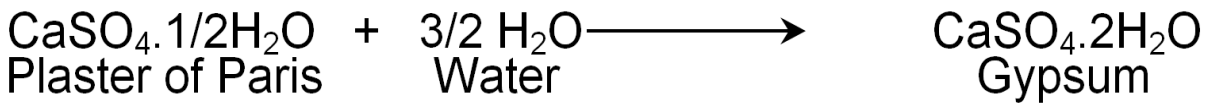
During this process care should be taken not to heat the gypsum above 373K because if gypsum is heated beyond the temperature 373 K then all the water of crystallization is removed from it which results in anhydrous calcium sulphate which is also called as dead burnt plaster. The disadvantage of this dead burnt plaster is that it doesn't set like plaster of Paris after adding in water.

$$\underset{\text{Gypsum}}{CaSO_4.2H_2O} \longrightarrow \underset{\text{Calcium sulphate}}{CaSO_4} + \underset{\text{Water}}{2H_2O}$$

Properties of Plaster of Paris

1. Plaster of Paris is a white powder.

2. It has a property of setting into hard mass when water is added into it, within half an hour. The setting of plaster of Paris is due to its hydration to form crystals of gypsum which set to form hard and solid mass.



Uses of Plaster of Paris

1. Plaster of Paris is used in hospitals for setting the fractured bones into right position because of its property of setting into hard mass after adding water into it. This way it helps in rapid and correct healing of fractured bones.

2. It is used for making toys, cheap ornaments, cosmetics, black-board chalk, decorative materials and casts for statues.

3. It is used by dentists for making casts of denture.

4. It is used in chemistry laboratories for sealing air-gaps in apparatus where air tight arrangement is required.

5. It is used for making walls of homes smooth before painting them and for making beautiful designs on the ceilings of houses and other buildings.

6. It is also used as a fire proofing material.

Gypsum

Gypsum is a soft sulphate mineral composed of calcium sulphate dihydrate, with the chemical formula ($CaSO_4.2H_2O$). It is widely mined and is used as a fertilizer and as the main constituent in many forms of plaster, blackboard/sidewalk chalk, and drywall.

Gypsum is a useful mineral material. It is extensively applied as construction material, most of which is produced as plaster for painting walls or making decorative material in buildings. Some gypsum ore deposits contain about 80% gypsum, which is excellent for producing plaster.
Raw gypsum ore could be processed into a variety of products such as a Portland cement additive, soil conditioner, industrial and building plasters, and gypsum wallboard.

What is the purpose of adding gypsum in cement?

Gypsum is a mineral and is hydrated calcium sulphate in chemical form. Gypsum plays a very important role in controlling the rate of hardening of the cement. During the cement manufacturing process, upon the cooling of clinker, a small amount of gypsum is introduced during the final grinding process.

Gypsum is added to control the “setting of cement”. If not added, the cement will set immediately after mixing of water leaving no time for concrete placing.