

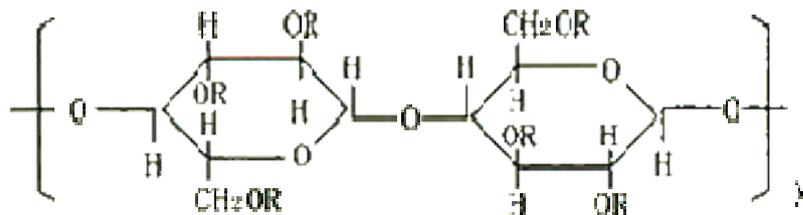
Hydroxypropylmethyl Cellulose for Pharmaceutical & Food

【Brief Introduction】

Chemical Name : Hydroxypropylmethyl cellulose (HPMC)

Molecular Formula : $[C_6H_7O_2(OH)_{3-m-n}(OCH_3)_m(OCH_2CH(OH)CH_3)_n]_x$

Structure Formula :



Where : R=-H, -CH₃, or -CH₂CHOHCH₃ ; X=degree of polymerization.

Product Characteristics

1. Appearance : HPMC is a white to light yellow powder or granular product.
2. Solubility : HPMC is nearly insoluble in anhydrous ethanol, ethyl ether and acetone. It is swelled in cold water to form a transparent or a slight cloudy solution. HPMC can be dissolved into some organic solvents and also in water-organic solvent mixed solvents.
3. Fineness(Graininess) : The oversize product above 100 mesh should not exceed 5.0%.
4. With reduction of methoxyl groups content, HPMC is increased in gelling temperature and decreased in water solubility and surface activity.

Properties

1. Resistance to salting out : HPMC is a nonionic cellulose ether and it is not a polyelectrolyte. The aqueous solution of HPMC is comparatively stable even in the presence of metal salts or organic electrolytes. However, when the concentration of electrolytes exceeds a certain limit, gelation and precipitation may result.
2. Surface activity : An aqueous solution of HPMC has a high surface activity and functions as a protective colloid agent, emulsion stabilizer and dispersant.
3. Thermal gelation : An aqueous solution of HPMC will gel or precipitate when heated to a certain temperature, but it reverts to the original solution state on subsequent cooling. The temperature at which gelation or precipitation occur depends on the type of HPMC, its concentration and the rate of heating.
4. pH stability : The viscosity of an aqueous solution of HPMC is hardly affected by

acid or alkali, and the product can develop an original viscosity in the range of 3.0~11.0. Therefore, the solution viscosity tends to keep stable during prolonged storage.

5. Water retention : HPMC is a high effective water retention agent. Its pharmaceutical grade product can be widely used in food, cosmetics and many other fields.
6. Film forming : HPMC provides a strong, flexible and transparent film having a good barrier property against oil and grease. In food application, this property is often utilized for water retention and oil adsorption.
7. Cohesiveness (Binding property) : HPMC, as a high performance binder, can also be used for molding food and medicine.

【Technical requirements】

HPMC conforms to the enterprise standards Q/LTP01 and Q/LTP02 and to China Pharmacopoeia (Edition 2000), U.S. Pharmacopoeia (USP24/NF19) and European Pharmacopoeia, Edition 4.

1. Appearance : White to light yellow powder or grains.
2. Specifications :

Table 1. Specifications of HPMC

Items	Specifications				
	MA	HF	HG	HJ	HK
Methoxyl group content, %	27.5~31.5	27.0~30.0	28.0~30.0	16.5~20.0	19.0~24.0
Hydroxypropyoxyl content, %	-	4.0~7.5	7.5~12.0	23.0~32.0	4.0~12.0
Loss on drying , %	5.0 max				
Residue on ignition , %	1.0 max				
Heavy metals (as Pb) , %	0.0020 max				
Arsenic salt , %	0.0002 max				
pH	4.0~8.0				
Fineness , oversize 80/100 mesh	5.0 max				
Viscosity , mPa.s	In accordance with the viscosity specification as shown in table 2.				

3. Viscosity specification

Table 2. Viscosity specification of HPMC

Viscosity grades	Viscosity range of 2wt% aqueous solution , mP.s	Viscosity grades	Viscosity range of 2wt% aqueous solution , mP.s
3	2.4~3.6	1500	1000~2000
5	4~6	4000	3000~5600
6	4.8~6.2	8000	6000~9000
15	12~18	10,000	9000~12000
50	40~60	15,000	12000~18000
100	80~120	20,000	18000~30000
400	300~500	40,000	30000~50000
800	600~900		

Note : The viscosity can be adjusted according to the special requirements of the customers.

【Applications】

HPMC are widely used as thickener, emulsifier, film-former, binder, dispersing agent, protective colloids, etc in construction materials, paints, paper making industry, printing, synthetic resins, ceramics, textiles, agriculture, etc.

Painting industry

In water-based paints, the product is of good shelf stability to keep homogeneous viscosity and the even dispersion of pigments. Meanwhile, it is nearly independent upon Ph value (applicable range of Ph value: 3~11).

The product shows different levels of enzyme resistance with different viscosities. Product with higher viscosity is of better enzyme resistance.

Film thickened by the product is of rapid coating performance, high adhesiveness, and resistance to scrapping, raining and freezing, as well as excellent homogeneity. Further more, due to its water retention, coating performance and good leveling property, it is helpful to improve the applications of paints and homogeneity of films.

Synthetic resins:

During the manufacturing of synthetic resins, such as PVC, polyvinylidene chloride, etc, suspension polymerization is most frequently used, where it must be stable hydrophobic monomer suspension in water. As a kind of water-soluble polymer, HPMC product is of excellent surface activity and action as colloidal protecting agent to prevent effectively polymeric particles from coagulating. In particular, although it is a kind of water-soluble polymer, HPMC is slightly soluble in hydrophobic monomers, where it enhances the production of porosity in the polymeric particles of monomers. Therefore, it can offer the polymers capability to remove the residual monomer and improve the quality of the absorptive plasticizer.

Ceramics

As a kind of binder for the molded refinery ceramic products, the relatively-high concentration solution of the product can be adsorbed on the surface of the ceramic grains, which can minimize the friction between the ceramic grains and improve the lubricity. Thus the molded ceramic products can obtain the desired surface smoothness and dimension stability. Additionally, the low ash content of this cellulose ether product contributes to the excellent electric properties of the sintered ceramic product.

Construction**1.Cement-based painting mortar**

- The product can improve the homogeneity of the mortar, which permits an easier painting of the mortar. Thus the working efficiency is improved and the resistance to sagging is enhanced.
- The excellent water retention of the product prolongs the workable time of mortar, improves the working efficiency and imparts high mechanical strength to mortar during coagulating period.
- The product can prevent the infiltration of air, eliminating the micro crevice of coat and permits the formation of desired smooth surface.

2.Putty

- The excellent water retention prolongs the workable time of putty, improves working efficiency, avoids occurrence of crusting phenomena and imparts high mechanical strength to putty during coagulating period.

- The surface smoothing performance offers fine, smooth and homogeneous quality to putty and thus improves the construction efficiency and resistance to shrinking and cracking, which permits the achievement of a high surface quality and delicate feel.

- The product can improve the homogeneity of the mortar, which permits an easier painting of the putty. Thus the working efficiency is improved and the resistance to sagging is enhanced.

3.Heat-preservation mortar system's binding mortar and coating mortar

- The product can improve the homogeneity of the mortar, which permits an easier painting of the mortar. Thus the working efficiency is improved and the resistance to sagging is enhanced.

- The product is of high water retention, which prolongs the workable time of mortar, improves the working efficiency and imparts high mechanical strength to mortar during coagulating period.

- The product brings in air, which improves the resistance to freezing and heating, offers effects of insulation from heat and sound and meanwhile reduces the weight of unit volume.

- Resistance to sagging.

4.Interface treatment binder

- The product improves the surface coating, enhances the adhesiveness and increases the binding strength of mortar.

- The excellent permeability improves the homogeneity of the interface.

- The product improves the lubricity and fluidity of mortar, which permits an easier painting of mortar and higher working efficiency.

5.Tile binder

- The good lubricity improves the processability of material, which permits an easier painting and higher tile-binding efficiency.

- The high water retention rate prolongs the open time and improves the tile-pasting efficiency.

- The excellent water retaining performance ensures an effective hydration of binder and improves the binding strength and shearing strength, where the performance index are higher than relative standard.

- Product of excellent resistance to slippery can be offered.

6.Gypsum-based mortar and gypsum products

- The product can improve the homogeneity of the mortar, which permits an easier painting, higher working efficiency and resistance to sagging.

- Excellent water retention prolongs the workable time and offers high mechanical strength during coagulation.

- High-quality surface coating can be obtained through controlling the homogeneity of the mortar consistency.

7.Sheet material sealant

- Excellent water retention can prolong the open time and improve working efficiency. High lubricity permits an easier painting and more smooth surface.

- The surface quality can be improved through improving the resistance to shrinking and cracking.

- The product can offer delicate, smooth and even sense and stronger binding of the matching faces.

8.Auto-leveling floor material

- The product improves the viscosity and acts as precipitation-resistance aid.

- The product can improving the floor-laying efficiency through enhancing the fluidity and pumpability.

- The product can radically reduce cracking and shrinking by controlling the water retention.

9.Extruded concrete sheeting material

- The addition of the product can reduce the friction coefficient and improve the lubricity of the extruded ceramic products and cement products.
- The high binding strength and lubricity of the product can improve the processability of the extruded products.
- The product can improve the wettability and the binding strength of the extruded sheeting material.

10. Other applications

- Binder-sticker and adhesive in herbicide and pesticide.
- Binder and viscosity-controlling aid in the mixture of enamel and ceramic glaze.
- Binder in color pen and pencil core.
- Gelling agent thickener in leather auxiliary.
- Thickener in printing ink.
- Stabilizer in concentrated liquid silylidyne.
- In textile paints.

【Packaging】

1. The product is packed in a polyethylene bag enclosed in a composite paper bag. The net weight is 20 kg a bag.
2. The product is packed in polyethylene bag enclosed in composite fiberboard drum. The net weight is 25 kg / 50 kg a drum.

【Transportation and Storage】

The product should be kept in the original bag and stored in the dry and clean place far away from the source of heat and not put together with other chemicals.

【Methods for Dissolving HPMC】

The direct addition of the product to water causes the formation of lumps. Lumping

results from incomplete wetting of the individual powder particles. Only the powder in contact with water dissolves and the formed gelatinous membrane prevents the remaining powder from dissolving, causing a delay in the dissolution time. The following three methods are recommended for dissolution without forming lumps. The most convenient method should be chosen according to the purpose of your application.

1. **Hot water method** : This method takes advantage of the insolubility of HPMC in hot water. Two typical methods are as follows :
 - a). Place the required volume of hot water heated to 70°C or above into a vessel. Gradually add the HPMC while stirring. At first HPMC floats on the surface of the hot water, but it will gradually disperse to form uniform slurry. Cool down the resultant mixture while stirring until it becomes transparent.
 - b). Place about 1/3 to 2/3 of the required volume of water into a vessel and heat to about 70°C. Then disperse the HPMC and prepare the hot water slurry according to method a). Add the remainder of the water as cold water or ice water while stirring to lower the temperature of the dispersion. Cool down the resultant mixture while stirring until it becomes transparent.
2. **Powder mixing method** : This method can be applied when water-insoluble ingredients are used with HPMC. Mix both the HPMC powder and water insoluble ingredients together in advance at the ratio of 1: more than 3 (volume) and blend the dry components thoroughly. Add water to the dry mixture and mix it by agitation. At this time HPMC can be dissolved without lumping.
3. **Organic solvent wetting method** : Disperse or wet the HPMC powder in alcohol or glycol in advance, and then add water to the dispersion while stirring until it dissolves completely.