Methyl Cellulose and Hydroxypropyl Methyl Cellulose

【Brief Introduction:】

Name: Methyl Cellulose
Abbreviation: MC
Molecular formula: \([\text{C}_6\text{H}_{12}\text{O}_6\text{OH}]_n \text{ (OCH}_3\text{)}_n\times\]
Structural formula:

Wherein, R stands for \(-\text{H}\) or \(-\text{CH}_3\) and X for degree of polymerization

Name: Hydroxypropyl Methyl Cellulose
Abbreviation: HPMC
Molecular Formula: \([\text{C}_6\text{H}_{12}\text{O}_6\text{OH}]_x-k\text{m-n(OCH}_3\text{)}_m \text{ (OCH}_2\text{CH(OH)CH}_3\text{)}_n\times\]
Structural formula:

Wherein, R stands for \(-\text{H}, -\text{CH}_3\) or \(-\text{CH}_2\text{CHOHCH}_3\) and X for degree of polymerization

Product properties:
Water solubility and thickening performance: This product is soluble in cold water, producing transparent viscous solution.
Solution in organic solvents: Containing certain amount of hydrophobic methoxy, the product is soluble in some organic solvents, as well as the mixture of water and organic solvent.
Resistance to salting out: Being a kind of nonionic and non-polymeric electrolyte, the product is relatively stable in water solution of metal salts or organic electrolytes.
Surface activity: Due to the surface activity of its water solution, it is capable of emulsification.
Thermal gelation: Having been heated up to certain temperature, the water solution of the product becomes unclear, producing precipitate, losing viscosity. Having been cooled gradually, it turns to the previous solution. The temperature for the occurrence of condensation and precipitation is dependent upon the product type, the solution concentration and the heating rate.
Low ash content: As a kind of nonionic product, it could be effectively refined with hot water during preparation. Thus the ash content is very low.
Stable Ph value: The viscosity of the water solution is rarely affected by acid or alkali. The product is relatively stable in the range of Ph value from 3.0 to 11.0.
Water retention: Due to its hydrophilicity and high viscosity of its water solution, it is highly capable of water retention while being added into mortar, gypsum, paints, etc.

Shape retention: Comparing with other water-soluble polymers, the water solution of the product is of special viscous and resilient property. It is helpful to improve the shape retention of extruded ceramic products.

Lubricity: It could reduce the friction coefficient and improve the lubricity of extruded ceramic products and cement products.

Film-formation: The product can produce strong, flexible and transparent film with excellent resistance to oil and ester.

【Technical requirement】
The product conforms to the enterprise standards.
1. Appearance: white to yellowish powder or grains.
2. Technical index

Table 1

<table>
<thead>
<tr>
<th>Item</th>
<th>Index</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MC</td>
</tr>
<tr>
<td>Methoxy content, %</td>
<td>27.5~31.5</td>
</tr>
<tr>
<td>Hydroxypropoxy content, %</td>
<td>4.0~12.0</td>
</tr>
<tr>
<td>Loss on drying, %</td>
<td>≤5.0</td>
</tr>
<tr>
<td>Ash, %</td>
<td>≤1.5</td>
</tr>
<tr>
<td>Ph value</td>
<td>4.0~8.0</td>
</tr>
<tr>
<td>Appearance</td>
<td>White to yellowish grains or powder</td>
</tr>
<tr>
<td>Fineness, oversize from 80/100mesh</td>
<td>≤5.0</td>
</tr>
<tr>
<td>Viscosity (mPa.s)</td>
<td>refer to Table 2</td>
</tr>
</tbody>
</table>

Table 2

<table>
<thead>
<tr>
<th>Level</th>
<th>Specific range (mPa.s)</th>
<th>Level</th>
<th>Specific range (mPa.s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>4~9</td>
<td>8000</td>
<td>6000~9000</td>
</tr>
<tr>
<td>15</td>
<td>10~20</td>
<td>10000</td>
<td>9000~12000</td>
</tr>
<tr>
<td>25</td>
<td>20~30</td>
<td>15000</td>
<td>12000~18000</td>
</tr>
<tr>
<td>50</td>
<td>40~60</td>
<td>20000</td>
<td>18000~30000</td>
</tr>
<tr>
<td>100</td>
<td>80~120</td>
<td>40000</td>
<td>30000~50000</td>
</tr>
<tr>
<td>400</td>
<td>300~500</td>
<td>75000</td>
<td>50000~85000</td>
</tr>
<tr>
<td>800</td>
<td>600~900</td>
<td>100000</td>
<td>85000~130000</td>
</tr>
<tr>
<td>1500</td>
<td>1000~2000</td>
<td>150000</td>
<td>130000~180000</td>
</tr>
<tr>
<td>4000</td>
<td>3000~5600</td>
<td>200000</td>
<td>≥180000</td>
</tr>
</tbody>
</table>

Note: Any other special requirement for the product can be satisfied through the negotiation between Supplier and Buyer.

Product designation example

RSK 40000 T
【Application】
MC and 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 uniform 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 scraping, 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. Recommended applications.

The product can be used as water-retaining agent and binder in:

* painting gypsum, gypsum putty, combining material, and
* adhesive of tile and marble, cement mortar and wall-body interface agent.

Applications of cellulose ether in construction material

refer to the following table
<table>
<thead>
<tr>
<th>Application Designation</th>
<th>Auto-leveling floor material</th>
<th>Paint gypsum</th>
<th>Painting gypsum putty</th>
<th>Gypsum putty</th>
<th>Interface agent</th>
<th>Binder of tile</th>
<th>Marble binder</th>
<th>Caulking agent and jointing agent</th>
<th>Water-resistant putty in paste form</th>
<th>Water-resistant putty in powder form</th>
<th>Heat preservation mortar</th>
<th>Anti-cracking agent</th>
</tr>
</thead>
<tbody>
<tr>
<td>RSK400T</td>
<td>++</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>++</td>
</tr>
<tr>
<td>RSK8000</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>RSK15000T</td>
<td>++</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>++</td>
</tr>
<tr>
<td>RSK20000T</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>RSK40000</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>RSK40000T</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>RSK75000T</td>
<td>+</td>
<td>+</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>+</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>RSK100000T</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>++</td>
</tr>
<tr>
<td>RSK150000T</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>++</td>
</tr>
<tr>
<td>RSK200000T</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>++</td>
</tr>
<tr>
<td>RSH400T</td>
<td>++</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>++</td>
</tr>
<tr>
<td>RSH8000</td>
<td></td>
<td>++</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>++</td>
</tr>
<tr>
<td>RSH40000T</td>
<td>++</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>++</td>
</tr>
<tr>
<td>RSH75000T</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>++</td>
</tr>
<tr>
<td>RSH100000T</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>++</td>
</tr>
</tbody>
</table>
Note: The above-mentioned applications are only for recommendation. Due to different applying conditions and applicable regulations in different places and different time, it is the customer instead of the seller that is responsible for determining the suitability of the mentioned products and product information.

**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.

**【Package】**

1. The product is packed in composite paper bag lined with polyvinyl film bag. The net weight of each package is 20kg.

2. The product is packed in paper drum lined with polyvinyl film bag. The net weight of each package is 10kg/20kg/50kg.

**【Precautions for storage and transportation】**

The product shall be kept in its original package and stored in dry and clean place that is far away from heat resource. It could not be stored together with any other chemical product.

**【Precautions for usage】**

Product after surface treatment (dispersing-in-cold-water type) can be directly added into the tap water. Under stirring it will disperse very soon. The pH value of the solution can be adjusted to the
range of 8~9 through addition of alkali, when the solution can obtain viscosity by agitation. The said alkali could be aqueous ammonia, sodium carbonate, etc.

Product without surface treatment does not dissolve in hot water at temperature above 85°C. However, it can swell and disperse in hot water. Usually the following methods are taken:

*Take hot water at 1/5~1/3 of the required amount, agitate to swell all the product, add the remained water (which could be cold water even ice water) and agitate to appropriate temperature when the product can be dissolved completely.

*Take all the required amount of hot water, pour into the product and agitate continuously. Cool the content under stirring to appropriate temperature when the product can be dissolved completely.

While dissolving cellulose ether product with hot-water method, cooling must be carried out fully. To reach the temperature required for complete solution and desired transparency depends upon the type of the cellulose ether.

**Dispersing by mixing dry product**

The product can be dispersed effectively through mixing in dry form prior to the addition of tap water, i.e., mixing it with some other compositions containing powder-type substance, dispersing it fully and then adding in tap water, where the product can be dissolved very quickly without lumping.

**Wetting with organic solvent**

First disperse the product into some organic solvent or wet the product with organic solvent and then add in or into cold water, where the product can be dissolved very well. Options for the said organic solvent are ethanol, glycol, etc.
**Direct addition during production**

First add some tap water into a vessel with high-revolution agitator, gradually and evenly add in the product under agitation and continue agitating until the product is completely dissolved.

**Precautions for solution preparation:**

1. Consistently stir the content during and after the addition of the product until enough viscosity is obtained.

2. Addition of the product after surface treatment into basic water solution will cause failure of the surface treatment and occurrence of lumping.

3. The concentration of the prepared solution is dependent upon the viscosity of the product: solution from low-viscosity product (≤400 mPa.s) can obtain concentration of 10%~15%; solution from high-viscosity product (≥30000 Pa.s) can obtain concentration maximum 2%~3%.