Technical Information

SUNROSE

Water-insoluble sodium carboxymethyl cellulose

Sunrose® SLD Series

- Product outline -

Sunrose® is a carboxymethyl cellulose (CMC) produced from carboxymethylated high-purity and biodegradable cellulose that is widely used in various fields and is not only harmless to humans but also features slow biodegradability, making it easy on the environment. NIPPON PAPER CHEMICALS has also developed Sunrose® SLD, slightly carboxymethylated cellulose. This type of CMC combines properties of both powdered cellulose and CMC.

General quality

<table>
<thead>
<tr>
<th>Product</th>
<th>SLD-F1</th>
<th>SLD-FM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Powder</td>
<td>Fine powder</td>
</tr>
<tr>
<td>Average particle size (μm)</td>
<td>50-60μm</td>
<td>15-20μm</td>
</tr>
<tr>
<td>Moisture (%)</td>
<td>less than 10.0%</td>
<td></td>
</tr>
<tr>
<td>PH</td>
<td>6.0-8.0</td>
<td></td>
</tr>
<tr>
<td>1% viscosity (mPa·s)</td>
<td>50-150mPa·s</td>
<td></td>
</tr>
<tr>
<td>Degree of etherification (mol/C6)</td>
<td>0.20-0.30mol/C6</td>
<td></td>
</tr>
<tr>
<td>Purity (%)</td>
<td>99.0% or greater</td>
<td></td>
</tr>
</tbody>
</table>

Basic performance

- SLD Series swells in both cold and warm water, dissolving slightly but not completely, and becomes mildly viscous.
- In water SLD Series exhibits superb dispersion stability and degradability.
- SLD Series prevents other suspended particles from caking and redisperses them.
- SLD Series exhibits excellent water absorption, water retention, shape retention, foam stability, and emulsion stability.
- By absorbing highly concentrated sugar solutions, it prevents “weeping”.

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### Application fields

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Food</strong></td>
<td>Beverages (cocoa, juices containing fiber and pulp, Shiruko, Amazake, etc.); Soup (corn soups, ramen soups, miso soups, consommés); sauces, dressings, ketchups, mayonnaise, jam, and yogurts; whip cream, fillings; tablet disintegrating agents (supplements, etc.); dried goods (dry processed foods, instant ramen, pasta noodles); ice creams, soft ice cream Monakas, edible films, confectionaries (gummies, soft candies); bread (sweet breads, cream-filled breads); other processed foods and ingredients for food processing (powdered azuki, etc.)</td>
</tr>
<tr>
<td><strong>Cosmetics</strong></td>
<td>Face powders, foundations, scrub face-washes, facial masks, face-wash foams, face-wash creams, hair mousses, shampoos, soaps, lotions, hair dyes, hair bleaches, mascaras, eye-liners, nails, antiperspirants</td>
</tr>
<tr>
<td><strong>Daily goods</strong></td>
<td>Toothpastes; cleansers for kitchen utensils, bathtubs, tiles, cars, etc.; pet foods; air-fresheners; disposable paper toilet seat covers; water-dissolving papers, nonwoven fabrics, etc.</td>
</tr>
<tr>
<td><strong>Papers</strong></td>
<td>Paper strengthener, water retention agent, coating agent, bulky papers, yield improving (oxidized titanium, etc.), etc.</td>
</tr>
<tr>
<td><strong>Milk substitutes</strong></td>
<td>Dispersion of plant proteins, emulsion stability, improvement in moisture-retaining properties</td>
</tr>
<tr>
<td><strong>Filtration (water removal)</strong></td>
<td>Cooking oils, various solvents</td>
</tr>
<tr>
<td><strong>Building material</strong></td>
<td>Fiber walls, sand walls, gypsum boards, etc.</td>
</tr>
<tr>
<td><strong>Civil engineering</strong></td>
<td>Air bubble shields</td>
</tr>
<tr>
<td><strong>Resin fillers, compounds</strong></td>
<td>Styrene foams, biodegradable resins, rubber, ceramics, vinyl chlorides</td>
</tr>
<tr>
<td><strong>Paint, varnish, artificial leather</strong></td>
<td>Matte paints, architectural coating/paints, interior coating/paints for vehicles, etc.</td>
</tr>
<tr>
<td><strong>Dispersant</strong></td>
<td>Carbon black fine particles, barium sulfate (x-ray contrast agent), oxidized titanium, dispersion of zinc oxide, etc.</td>
</tr>
<tr>
<td><strong>Moisture absorption aid</strong></td>
<td>Improves shape retention properties of materials such as calcium chloride and other deliquescent agents when absorbing moisture</td>
</tr>
<tr>
<td><strong>Others</strong></td>
<td>Fiber (texture modifier for fabrics and threads), fluid carriers, lubricants, etc.</td>
</tr>
</tbody>
</table>

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Water-insoluble sodium carboxymethyl cellulose
Sunrose® SLD Series
– Physical characteristics, grain size distribution –

When Sunrose® SLD Series is dispersed in water, the carboxymethylated portion will absorb water and swell. However it does not swell in organic solvents such as methanol. Therefore grain size distribution and average particle size will vary depending on the solvent.

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Sunrose® is a carboxymethyl cellulose (CMC) produced from carboxymethylated natural cellulose that is widely used in various fields and is not only harmless to humans but is also biodegradable, making it environmentally friendly. NIPPON PAPER CHEMICALS has also developed Sunrose® SLD, slightly carboxymethylated cellulose. This type of CMC combines properties of both powdered cellulose and CMC.

**Sunrose® SLD model**

[Diagram showing the transformation of cellulose to SLD with hydrophilic groups introduced in their presence.]

### Water absorption of Sunrose® SLD Series

<table>
<thead>
<tr>
<th>Product</th>
<th>KC Flock (powdered cellulose)</th>
<th>Sunrose® SLD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average particle size (μm)</td>
<td>50</td>
<td>24</td>
</tr>
<tr>
<td>Water absorption volume (g/g)</td>
<td>5.7</td>
<td>2.7</td>
</tr>
</tbody>
</table>

**Sunrose® SLD Series increases its water absorbency by 3 to 7 times compared to powdered cellulose products, ensuring better water retention.**

### Water-absorption testing

Drip water on a 1-gram sample and measure water absorption (grams of water per gram of sample) to the point where the water begins to seep out.

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When Sunrose® SLD Series is dispersed in water, the carboxymethylated portion will absorb water and swell, forming a three-dimensional structure.

**Emulsion stability of Sunrose® SLD Series**

**Method for emulsion preparation**

An emulsion is prepared by adding each agent (0.5%) to a mixture of water and vegetable oil (50:50), which is then agitated for 5 minutes with a Homo Mixer at 8,000rpm.

In an emulsion using the SLD Series, minute drops of oil are dispersed and held within the three-dimensional mesh structure. By preventing the oil droplets from clustering, SLD Series ensures the emulsion remains stable.

**Samples:** 1) SLD Series, 2) commercial cellulose formula, 3) CMC, 4) powdered cellulose, 5) control, 6) SLD Series

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Sunrose® SLD-FM

– Cocoa beverage application –

Sunrose® SLD-FM features excellent dispersion stability in water. When used for preparing colloid beverages such as cocoa, it exhibits superb anti-caking and redispersion properties.

Recipe for cocoa beverage sample

<table>
<thead>
<tr>
<th>Sample</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cocoa powder (marketed product)</td>
<td>1.0</td>
<td>←</td>
<td>←</td>
</tr>
<tr>
<td>Water</td>
<td>99.0</td>
<td>←</td>
<td>←</td>
</tr>
<tr>
<td>Third-party cellulose formula</td>
<td>0</td>
<td>0.2</td>
<td>0</td>
</tr>
<tr>
<td>SLD-FM</td>
<td>0.2</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Weight section

After preparing a 1% cocoa solution, a predetermined amount of each sample was added and mixed well (stabilizer: 0.2%).

24 hours after preparation

1. SLD-FM
2. Competitor’s Products
3. Control

Redispersion characteristics of SLD-FM

When the bottles are shaken once

Each exhibits settling

Shaken twice...

Some redispersion

Shaken three-times

Thorough redispersion of SLD

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