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Product Name: Hydroxypropyl Methylcellulose

INCI Name: Hydroxypropyl Methylcellulose

CAS: 9004-65-3

Chemical Classification: Modified cellulose ether, hydrophilic colloid

Functional Category: Viscosity modifier, thickener, emulsion stabilizer, film-former

IUPAC Name: Cellulose, 2-hydroxypropyl methyl ether. This name is used generically to describe modified cellulose ether wherein cellulose hydroxyl groups are partially substituted with methyl and hydroxypropyl groups. Note: Since HPMC is a polymer with variable degrees of substitution, there is no single, complete IUPAC name covering all structural variations - thus, this functional description indicating the modification type is used.

Description: Hydroxypropyl Methylcellulose (HPMC - 700) is a nonionic, semi-synthetic cellulose polymer used primarily in cosmetics as a thickener, emulsion stabilizer, and film-former. It is created through chemical modification of natural cellulose by introducing hydroxypropyl and methyl groups, enhancing its solubility and functionality in aqueous environments. Upon contact with water, it forms a clear, pseudoplastic gel that improves sensory properties of formulations and ensures system stability, often without additional emulsifiers in certain gel-emulsions. Due to its chemical stability and inertness, it is compatible with most active ingredients, commonly utilized in facial gels, lotions, serums, ophthalmic preparations, and products for sensitive areas, such as around the eyes. It does not clog pores, does not cause irritation, and is suitable for formulations intended for sensitive skin. It is also used to modify the rheological properties of formulations, allowing easy spreadability, uniform application, and retention of active ingredients on the skin surface. Due to biodegradability, non-toxicity, and its natural cellulose origin, HPMC is considered environmentally friendly and frequently used in natural and vegan cosmetics.

Physicochemical Properties: Hydroxypropyl Methylcellulose (HPMC - 700) appears as a fine white or pale cream-colored powder, odorless and distinctly hygroscopic. Its ability to dissolve in cold water without heating allows the formation of a stable, viscous pseu-

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doplastic gel, suitable for heat-sensitive formulations. At a concentration of 2%, at 20°C, it exhibits viscosity between 65,000 and 75,000 mPa·s. The material has a pH of 6.6 in a 1% aqueous solution, within a neutral to slightly acidic range, making it compatible with most cosmetic actives. Moisture content is low, with a measured loss on drying of 4.65%, indicating good storage stability, while ash content, a measure of inorganic residue, is 2.32%, well below permissible limits. Particle size is uniform, with more than 90% passing through an 80-mesh sieve, facilitating easy dispersion and uniform distribution in formulations. Decomposition temperature ranges between 190 and 200°C, demonstrating thermal stability under typical production conditions. Bulk density was not specified but generally ranges from 0.25 to 0.55 g/cm³ depending on packaging compression. Due to its stability, compatibility, and safety profile, HPMC - 700 is used as a reliable thickener and stabilizer in various cosmetic systems, including those for sensitive areas and heat-free formulations.

Mechanism of Action: The mechanism of action of Hydroxypropyl Methylcellulose (HPMC - 700) in cosmetic formulations is based on its ability to form highly stable, viscous gels in aqueous phases, facilitated by the hydrophilic methoxy and hydroxypropyl groups that strongly interact with water molecules. Upon dispersion in cold water, HPMC - 700 molecules absorb water and expand significantly, establishing a dense network of hydrogen bonds between polymer chains and water. The result is a robust three-dimensional rheological structure effectively retaining water and stabilizing the formulation, ensuring high viscosity even at low concentrations. This property enables precise texture control, prevents phase separation, and enhances product stability over a broad temperature range. Simultaneously, HPMC - 700 acts as a film-former, leaving a persistent yet thin and transparent protective layer on the skin that reduces transepidermal water loss, prolongs the effectiveness of active ingredients, and protects the skin from external influences. Due to its nonionic nature and inertness, this film does not clog pores, does not disrupt skin barrier function, and is suitable for formulations intended for sensitive areas like around the eyes. In emulsions, HPMC - 700 significantly increases the viscosity of the continuous aqueous phase, reducing dispersed oil droplet movement, minimizing coalescence, and maintaining system stability even with reduced emulsifier content. It is particularly useful in high-viscosity formulations, such as rich creams, hair styling gels, and targeted treatment products. Due to its pronounced pseudoplastic behavior - where viscosity decreases with stirring and quickly recovers at rest - it facilitates easy application and spreading, forming a firm yet pleasant texture on the skin, enhancing protection and long-lasting hydration.

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Benefits:

- Forms stable gels without heating.
- Provides medium to high viscosity at low concentrations.
- Compatible with a wide pH range and most active ingredients.
- Acts as a film-former, protecting the skin from dehydration.
- Does not clog pores, suitable for sensitive skin.
- Stabilizes emulsions by increasing aqueous phase viscosity.
- Improves texture and allows easy, even application.
- Exhibits pseudoplastic behavior for easier spreading.
- Easily dispersible without forming lumps.
- Biodegradable and skin-safe.

Usage Method: Hydroxypropyl Methylcellulose (HPMC - 700) is used in cosmetic formulations requiring high viscosity and stable gel structures at low doses. The application begins by dispersing the powder in cold water with moderate stirring for uniform dispersion without lump formation. The mixture is left to hydrate, gradually forming a thick, homogeneous gel. In emulsions, HPMC - 700 is added to the aqueous phase prior to emulsification to enhance stability and control rheological properties, while in gels, it serves as the primary thickener, often without additional polymers. Due to its exceptionally high viscosity, concentrations of 0.1% to 0.5% are sufficient for significant thickening in lotions and serums, whereas treatment gels and masks typically use concentrations up to 1%. Higher doses are avoided as they can yield overly thick and difficult-to-spread textures. Depending on the targeted formulation effect, HPMC - 700 allows product formulation with pronounced film-forming and stabilizing properties, ideal for preparations requiring persistence, structure, and precise viscosity control.

Natural or Synthetic Ingredient: HPMC is semi-synthetic, derived from natural cellulose through chemical modification.

Animal Testing: Not tested on animals.

GMO: GMO-free.

Vegan: Free from animal-derived components.