Nouryon

Dry-Flo® TS / Dry-Flo® TS Pure starches

For improved aesthetics

INCI: Tapioca Starch (and) Polymethylsilsesquioxane

Dry-Flo TS/TS Pure starches are modified tapioca starches which enhance the aesthetics of a broad variety of skin care products. Dry-Flo TS Pure starch is an irradiated version of Dry-Flo TS starch and possesses a cleaner microbiological profile. The properties, features and benefits of Dry-Flo TS/TS Pure starches are similar as those found with Dry-Flo PC or Dry-Flo Pure starches, however, the novel chemistry used in the design of Dry-Flo TS/TS Pure starches has produced two very distinct improvements.

First, since an aluminum salt is not used in the production of Dry-Flo TS/TS Pure starches, these products are aluminum-free. Second, Dry-Flo TS/TS Pure starches are modified with polymethylsilsesquioxane, which imparts a velvety and soft after-feel to the skin.

Due to their desirable feel properties, Dry-Flo TS/TS Pure starches can be utilized to cost effectively improve aesthetics in a variety of cosmetic products. Useful as effective talc replacements, Dry-Flo TS/TS Pure starches are natural polymers which can adsorb oil and do not produce undesirable whitening on the skin. Perhaps the most distinctive property of these unique products is its ability to impart a pleasant light, dry, and silky after-feel to finished formulations. Dry-Flo TS/TS Pure starches have the ability to mitigate greasiness – even in formulations containing high levels of oil.

Recommended applications

- Lotions and creams
- Color cosmetics
- Dry shampoos
- Powders
- Wipes
- Antiperspirants/deodorants

Features and benefits

Features	Benefits
Broad compatibility	Compatibility with other ingredients offers formulation flexibility. Can be used with a wide range of other raw materials such as oils, emollients, silicones, UV filters, vitamins, botanical extracts, alpha and beta hydroxy acids, dihydroxyacetone, fragrances and dyes.
Tapioca starch	Aluminum-free modified natural polymer. Biodegradable, based on non-genetically modified starch. Low protein content for sensitive skin and reduced allergy concerns. Free-flowing. Soft, powdery feel. Non-whitening on the skin. Talc replacement. Easily dispersed in cold water. Cost effective additive for a variety of skin care products. Improves aesthetics of a broad spectrum of formulations.
pH stability	Suitable systems in a pH range from pH 4 to pH 8
Oil-adsorber	Mitigates greasiness of lotions, creams, and ointments

Suggested use levels, as supplied

Application	% active
Emulsions	1% for sprays up to 10% for traditional creams and lotions
Ointments	up to 30
Powders	5-95

Formulation guidelines

Processing requirements

For use in the powder form, Dry-Flo TS/TS Pure starches can be handled like any other natural starches. For use in emulsion and hydroalcoholic systems, the starches should be added as a powder directly to the emulsion with proper mixing. Care must be taken to incorporate the starch at 45°C or below when used in aqueous systems. If temperatures above 45°C are encountered, the starch granule may begin to swell, reducing its effectiveness as an aesthetic enhancer and could potentially increase the formulation viscosity.

Dry-Flo TS/TS Pure starches may also be slurried in glycols or glycerin and incorporated into the formula with proper mixing at temperatures below 45°C. While the biopolymer is tolerant to shear, it should not be extensively homogenized due to potential degradation of the starch.

Compatibility

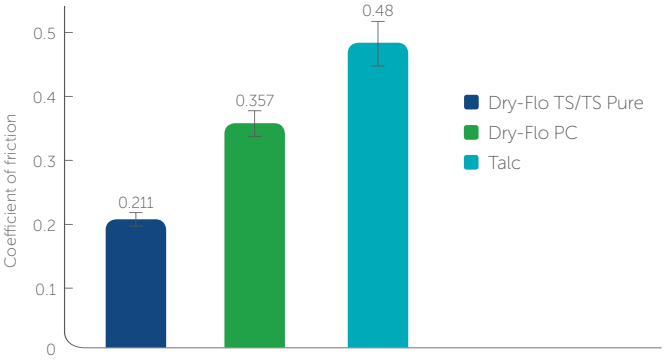
Dry-Flo TS/TS Pure starches are compatible with a wide range of commonly used cosmetic raw materials, including anionic, non-ionic, and cationic ingredients. In addition, these polymers can be used with skin care actives such as sunscreens (organic and inorganic). Dry-Flo TS/TS Pure starches can also be used in combination with other thickeners and emulsifiers.

Performance properties

Friction

Friction testing is a measurement of surface friction, i.e. the frictional force required to pull a material sample, at a specified speed, for a specified distance over a horizontal surface. In frictional force testing (COF testing), the sample is normally wrapped around a metal block of specific dimensions and mass - called a 'sled', and another sample of the material is attached to a horizontal table. The less friction the product displays, the more slippery and smoother it feels. The coefficient of friction (COF) results for Dry-Flo TS/TS Pure starches compared to other commercially available aesthetic enhancers are displayed in the figure below.

Coefficient of friction results for various aesthetic enhancers

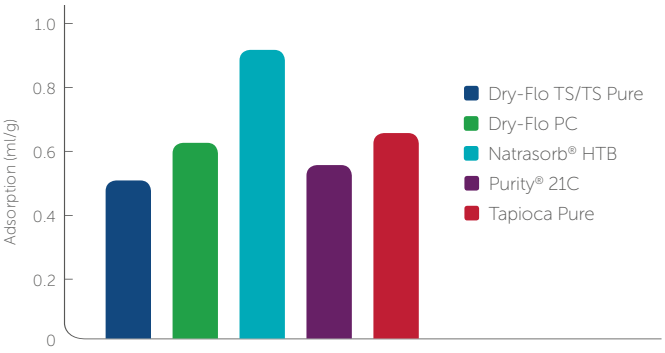


Dry-Flo TS/TS Pure starches provides less friction (COF), which translates to a smoother feel on skin, compared to other aesthetic enhancers

Oil-adsorption

The oil adsorption of a powder is defined as the number of grams of synthetic sebum oil absorbed by 0.1-1.0 grams of the powder. Thus this test is a measure of the ability of a powder to hold onto oil. Dry-Flo TS/TS Pure starches were compared for oil adsorbency vs. other starches, with the results displayed in the figure below.

Oil adsorption of various starch technologies



Dry-Flo TS/TS Pure starches provide similar or improved oil adsorbency compared to other starch-based aesthetic enhancers

Dry-Flo PC	Aluminum Starch Octenylsuccinate
Natrasorb HTB	Aluminum Starch Octenylsuccinate (and) Acrylates Copolymer (and) Magnesium Carbonate
Purity 21C	Zea Mays (Corn) Starch
Tapioca Pure	Tapioca Starch

Sensory evaluation

A trained in-house sensory panel (9 subjects) was used to compare O/W lotion formulations containing Dry-Flo TS/TS Pure starches vs. a control base without starch product.

Coefficient of friction results for various aesthetic enhancers

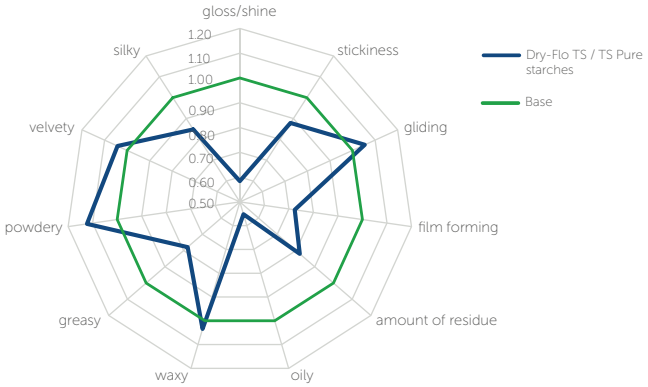
Ingredient	2364-84AB Dry-Flo TS Wt%	2364-84AC base Wt%
Phase A		
Water (Aqua)	65.35	65.35
Glycerin	5.00	5.00
Phenoxyethanol, Methylparaben, Ethylparaben, Butylparaben, Propylparaben, Isobutylparaben	1.00	1.00
Xanthan Gum	0.15	0.15
Phase B		
Glyceryl Stearate, PEG-100 Stearate	2.00	2.00
Persea Gratissima (Avocado) Oil	6.00	6.00
Simmondsia Chinensis (Jojoba) Seed Oil	6.00	6.00
Olea Europaea(Olive) Fruit Oil	7.00	7.00
Dimethicone	1.00	1.00
Phase C		
Carbomer	0.20	0.20
Phase D		
Water (Aqua)	1.00	1.00
Triethanolamine	0.30	0.30
Phase E		
Dry-Flo® TS/TS Pure starches	5.00	
Water (Aqua)		5.00

The following attributes were evaluated after 5 minutes of product application:

- Gloss/shine: amount of light reflected off the skin
- Stickiness: degree to which the fingers stick to residual product
- Gliding (slipperiness): the ease of moving fingers across skin
- Film forming (coverage): amount of cohesive and uniform coverage felt between fingers and skin
- Amount of residue: amount of product on skin
- Oily residue: type of residue that feels like baby oil
- Greasy residue: type of residue that feels like petrolatum
- Waxy residue: type of residue that feels like a wax or pomade
- Powdery residue: the type of residue that feels like talc
- Velvety residue: the type of residue that feels velvety and fluffy
- Silky residue: the type of residue that feels smooth and silky, similar to silicone

All data has been normalized, with the base control reported as 1.0 for all attributes. The higher numerical value translates to more of the attribute perceived by the panelists.

Coefficient of friction results for various aesthetic enhancers



Dry-Flo TS/TS Pure starches provide significantly reduced shine and a significant reduction in oily feel on skin compared to the base formula. Dry-Flo TS/TS Pure starches yield a skin after-feel that is mainly powdery, similar to the after-feel of talc.

Storage and handling

Dry-Flo TS/TS Pure starches are a finely divided organic particulate. When handling, avoid generation of dust. Use in a well ventilated area. Use of a dust mask is recommended. Avoid contact of the Dry-Flo TS/TS Pure starches powder or dust with heat, sparks, or open flame. Dry-Flo TS/TS Pure starches should be stored in a cool, dry location away from heat, sparks, or fire. Good industrial hygiene practices should be followed when working with this starch.

Please read the MSDS before working with this or any other chemical.

Health and safety

A health and safety summary for Dry-Flo TS/TS Pure starches is available on request. Dry-Flo TS/TS Pure starches are readily biodegradable and not genetically modified. In addition, Dry-Flo TS/TS Pure starches contain very low protein content which makes them suitable for sensitive skin or other products where allergens are of concern. The suitability of the final formulations should be confirmed in all respect by appropriate evaluation. The marketer is advised to evaluate the final formulation with regard to performance and health safety.

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Nouryon is a global, specialty chemicals leader. Markets and consumers worldwide rely on our essential solutions to manufacture everyday products, such as personal care, cleaning goods, paints and coatings, agriculture and food, pharmaceuticals, and building products. Furthermore, the dedication of more than 7,900 employees with a shared commitment to our customers, business growth, safety, sustainability and innovation has resulted in a consistently strong financial performance. We operate in over 80 countries around the world with a portfolio of industry-leading brands. Visit our website and follow us @Nouryon and on LinkedIn.

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