

Glycosphere-PPY

Stable Papain for Enzymatic Peeling, Skin Whitening and Hair Revitalization

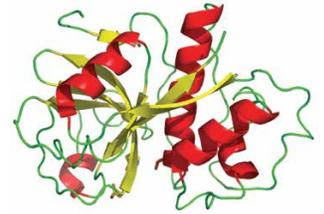


Papain

Papain is an enzyme present in the fruits of *Papaya carica*, the Papaya tree. It is a proteolytic enzyme which breaks down proteins. In skin care products, it can be used to hydrolyze *stratum corneum* proteins and promote the elimination of dead skin cells. As such, it is often presented as an alternative to AHA's (Alpha Hydroxy Acids) for enzymatic peeling to obtain smoother and younger looking skin. Papain has demonstrated action in revitalizing hair by

removing the uplifted scales of the cuticle, smoothing the hair fiber and restoring shine. It is used in skin whitening products, as a tyrosinase inhibitor and because its proteolytic activity promotes fast cell turnover.

However, due to poor stability of its tri-dimensional structure as all enzymes, it is unlikely to maintain its activity in a formulation over a long period of time and need to be protected.



Three-dimensional structure of Papain

Glycosphere-PPY

Glycospheres are submicron delivery systems. They can entrap enzymes such as papain within their hydrophilic inner core, separating them from the constituents of cosmetic formulas and protecting them from degradation. Papain keeps its enzymatic activity after entrapment, and the size of the Glycospheres (200nm) prevents it from penetrating deep into the epidermis.

Applications

- Enzymatic peeling in skin care products
- Hair revitalization
- Helps skin whitening
- Gs-PPY is best formulated by replacing part of the water in the formula by the Glycosphere suspension
- Recommended use level is between 1 and 5%



Glycospheres are based on a stable inner core, made of a network of cross-linked starch. This polysaccharide has been modified with a quaternary ammonium, which allows it to bind and entrap poly-anions like Papain. The core is surrounded by lipid layers which help protect the entrapped molecules.

INCI name:

Water (And) Papain (And) Palmitoyl Hydroxypropyltrimonium Amylopectin/Glycerin Crosspolymer (And) Phenoxyethanol (And) Hydrogenated Lecithin (And) Parabens



KFL-080B

Anti-Aging Refreshing Spray

Part 1

- Deionized Water - Water 69.60%
- Butylene Glycol - Ruger Chemical: *Butylene Glycol* 5.00%
- Germaben® II - ISP: *Propylene Glycol (And) Diazolidinyl Urea (And) Methylparaben (And) Propylparaben* 1.00%
- MOISPRAY C - Daito/Kobo Products: *Microcrystalline Cellulose (And) Cellulose Gum* 1.00%
- Keltrol® CG - CP Kelco: *Xanthan Gum* 0.30%
- Allantoin - DSM Nutritional Products: *Allantoin* 0.10%

Part 2

- CXG-1103 - Avantor/Kobo Products: *Cyclopentasiloxane (And) Cyclohexasiloxane (And) Dimethicone/Vinyl Dimethicone Crosspolymer* 5.00%
- JOS10M5 - Kobo Products: *Simmondsia Chinensis (Jojoba) Seed Oil (And) Silica* 5.00%
- SunBoost ATB™ - Kobo Products: *Argania Spinosa Kernel Oil (And) Tocopheryl Acetate (And) Bisabolol* 5.00%
- Xiameter® PMX-200 Silicone Fluid 350CS - Dow Coming: *Dimethicone* 3.00%

Part 3

- Gs-PPY - Kobo Products: *Water (And) Papain (And) Palmitoyl Hydroxypropyltrimonium Amylopectin/Glycerin Crosspolymer (And) Phenoxyethanol (And) Hydrogenated Lecithin (And) Parabens* 5.00%

Manufacturing Procedure:

1. Disperse MOISPRAY C and Xanthan Gum in Butylene Glycol. Add to water and homogenize at 5000rpm for 10 minutes. Add the rest of Part 1 while homogenizing.
2. Add Part 2 while homogenizing.
3. Add Part 3 while mixing.

Description:

This Anti-Aging Refreshing spray helps to rejuvenate skin and set make-up. The basis of this unique formula is MOISPRAY C which exhibits thixotropic and emulsifying properties allowing for a sprayable gel. JOS10M5 provides additional structure to this gel spray. CXG-1103 imparts a creamy, gel texture and helps provide a light cushion to the skin. SunBoost ATB™ contains a proprietary ratio of anti-oxidants, anti-irritant, and anti-inflammatory agents for anti-aging. Gs-PPY contains papain and aids in skin cell turnover.

KOBO

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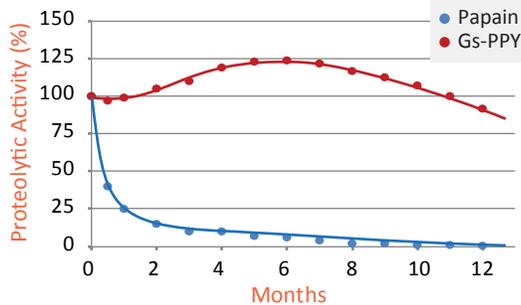
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Stability of Entrapped Papain Over Time

Proteolytic Activity

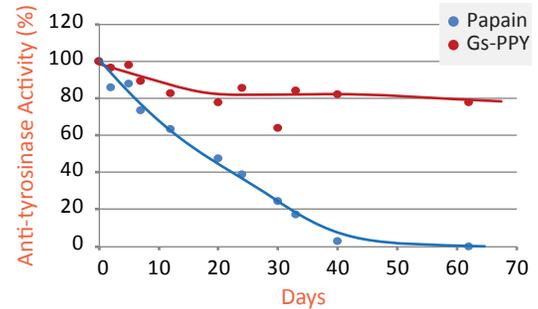
The proteolytic activity of papain, in solution or entrapped in Glycospheres was tested in vitro, using a synthetic substrate (benzoyl arginine para-nitroanilide/L-BAPA). Glycosphere-PPY and Papain in an aqueous solution (as control) were kept at 40°C and their activity was measured regularly over a period of one year. The graphic below shows that papain in solution rapidly loses its activity, but papain protected by the Glycosphere core retains most of its activity after a year at elevated temperatures.



Papain (either in solution or as Gs-PPY) was dispersed in a buffer in the presence of cysteine and EDTA, then incubated 30 min with the L-BAPA substrate before the reaction was stopped with acetic acid. The release of the chromophore was measured with a spectrophotometer (410nm) and plotted on the graph as a percentage of the initial activity.

Anti-Tyrosinase Activity

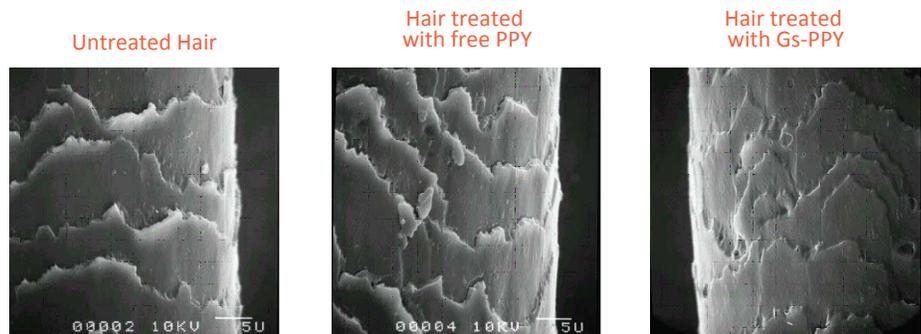
The capacity of papain to inhibit melanin synthesis by deactivating tyrosinase was tested in vitro, using tyrosinase and L-DOPA, the substrate tyrosinase converts. Glycosphere-PPY and Papain in an aqueous solution (as control) were kept at 40°C and their activity was measured regularly over a period of two months. The graphic below shows that papain in solution rapidly loses its activity, but papain protected by the Glycosphere core retains most of its activity even at elevated temperatures.



Papain (either in solution or as Gs-PPY) was dispersed in a potassium buffer in the presence of L-DOPA, then incubated 15 min with tyrosinase. The amount of Dopachrome, formed from L-DOPA by incubation with tyrosinase, was measured with a spectrophotometer (476nm). A lower amount of Dopachrome released when papain is present shows that papain inhibits tyrosinase. The inhibition of tyrosinase activity was plotted on the graph as a percentage of the initial inhibition.

Effect of Gs-PPY on Hair Cuticle

To evaluate the effect of papain on hair cuticles, tresses were soaked in either water, a papain solution or an aqueous suspension of Gs-PPY. SEM pictures of the cuticle surfaces were then taken. Water and papain solution treatments show rough surface with lifted cuticles, but Gs-PPY treated hair has a smoother surface, which should result in silky and shiny hair.



Hair tresses were treated for 15 minutes with water, a papain solution or an aqueous suspension of Gs-PPY (1% papain). SEM pictures were then taken.