

TEGO® Cosmo PGA

A natural and biodegradable biopolymer with moisturizing benefits

- Is a polypeptide of the amino acid L-glutamic acid
- Is a film former with moisturizing properties
- Provides smooth sensory skin feel
- Is biodegradable
- Usage concentration: 0.1–0.5 %

Personal Care

INCI Name (PCPC name)

Sodium Polyglutamate

Chemical and physical properties (not part of specifications)

Form	Off-white powder
------	------------------

Gamma Polyglutamic Acid is a naturally occurring biopolymer present in fermented soybean, a traditional healthy food very popular in Japan for over eight hundred years and known as "Natto".

TEGO® Cosmo PGA is the biosynthetic gamma polyglutamic acid, polypeptide of the amino acid L-glutamic acid, formed by bonding between alpha amino group and gamma carboxyl group (figure 1). Its unique production process is based on fermentation of L-glutamic acid by *Bacillus subtilis natto*, the same microorganism as the one used for the preparation of "Natto". TEGO® Cosmo PGA is edible, non toxic to human body and biodegradable.

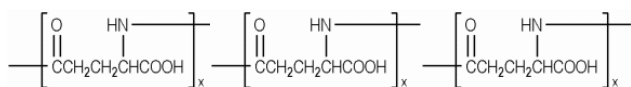


Figure 1: Structure of γ - Polyglutamic Acid

Properties

The characteristic multi-carboxylic functional groups of Polyglutamic acid make it a polyanionic biopolymer with multifunctional benefits. Polyglutamic acid can be used for instance as a thickener or texture enhancer in the food industry. It is known to facilitate calcium absorption improving osteoporosis conditions when used as a nutrition supplement. It can also act as a controlled release drug carrier in medical applications.

In cosmetics, polyglutamic acid is known as a film-former with moisturizing properties providing a smooth sensory skin feel. Its polyanionic character provides chelating properties for divalent cations.

Therefore it will support the solubilisation, delivery and bioavailability of biologically important cations like calcium or magnesium.

Evaluation of moisturizing properties of TEGO® Cosmo PGA

• Sorption/ Desorption

The sorption-desorption test (SDT) is an advanced method for the *in vitro* functional analysis of hydration kinetics like hygroscopicity and water-holding capacity.

TEGO® Cosmo PGA and glycerin as a reference were dried over night at 80 °C and 0 % relative humidity (rH). Samples were then cooled down to room temperature in a desiccator and 4 to 5 g of the products were weighed on a Petri dish. Afterwards, TEGO® Cosmo PGA and glycerin were incubated over 24 hours at different relative humidities in a climatic room and the weight was controlled. For evaluation of sorption the humidity was increased from 20 to 80 %, whereas it was reduced from 80 to 20 % to evaluate desorption.

A direct comparison of TEGO® Cosmo PGA with glycerin is shown in Figure 2. It could be demonstrated that in contrast to glycerin TEGO® Cosmo PGA shows a significant hysteresis over the whole humidity range tested, meaning that TEGO® Cosmo PGA shows good performance to complex and keep water while glycerin only fixes the water without being able to bind it with hysteretic efficacy.

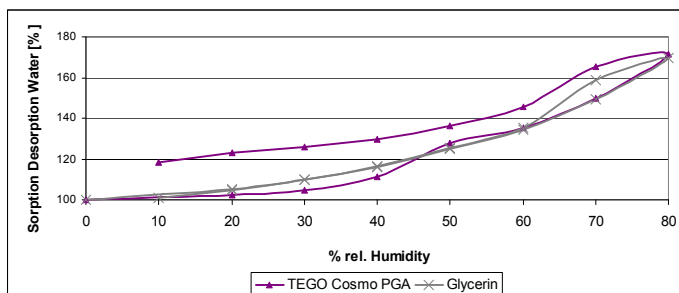


Fig. 2: Sorption / Desorption efficacy of TEGO® Cosmo PGA

• IMS-Membrane

IMS-Membrane is a testing substrate that effectively mimics the surface properties of human skin. It contains both optimized protein and lipid components and is designed to have topography, pH, critical surface tension and ionic strength similar to human skin.

Test formulations with 0.4 % TEGO® Cosmo PGA, 5 % glycerin as a reference and vehicle were applied under climate conditions of 21–22 °C and 72 % r.H. to IMS-Membranes, preliminary weighed. After 4 hours of incubation, IMS-membranes were weighed again. Water retention was then calculated based on formulation weight differences before and after incubation.

The principle is that the test formulation interacts with the IMS–Membrane binding water and preventing its evaporation.

As illustrated in figure 3, TEGO® Cosmo PGA shows strong water retention capacity out of a formulation in comparison to glycerin. This indicates the significant moisturizing benefits of TEGO® Cosmo PGA.

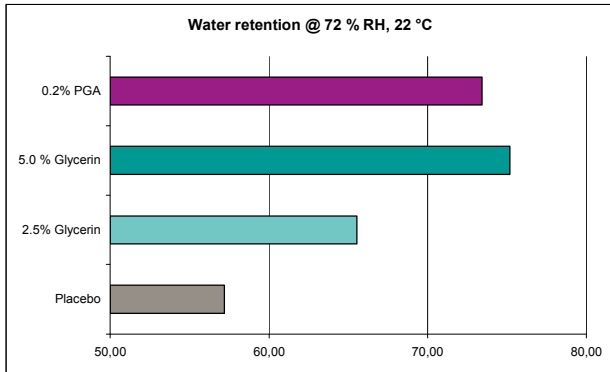
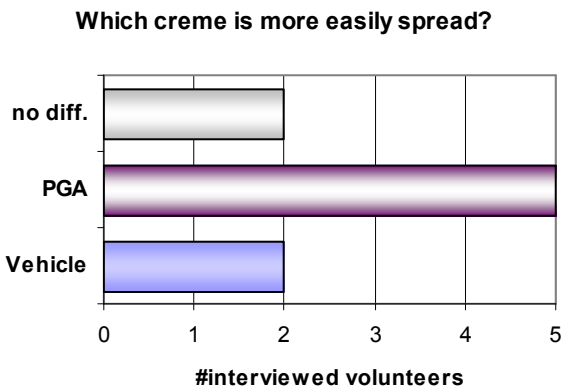


Figure 3: Water retention capacity of TEGO® Cosmo PGA

Evaluation of sensory benefits of TEGO® Cosmo PGA

Nine panelists applied a test formulation containing 0.5 % TEGO® Cosmo PGA twice a day over a period of 4 weeks. Results of volunteers evaluation about the easiness to distribute the cream on the skin and their preference is shown in Figure 4.



Which skin feel after permeation do you prefer?

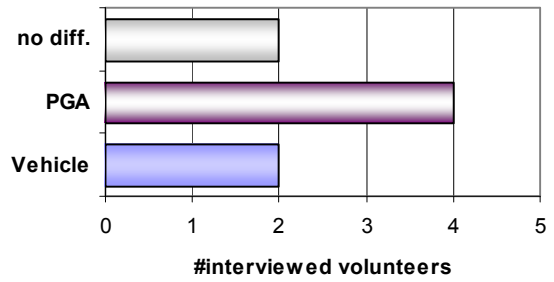


Figure 4: Sensory evaluation of TEGO® Cosmo PGA

The cream containing TEGO® Cosmo PGA is clearly outperforming the vehicle according to sensory evaluation.

Further *in vivo* evaluation has been made with TEGO® Cosmo PGA as part of the TEGO® Smooth. For details, please refer to the data sheet of TEGO® Smooth.

Preparation

TEGO® Cosmo PGA is water soluble and could be added in theory to the water phase of an emulsion. However, it might disturb the built up of the viscosity especially in O/W emulsions. For this reason TEGO® Cosmo PGA should be added to the emulsion as an aqueous solution (approximately 5%) during the cooling process at temperatures below 40°C.

TEGO® Cosmo PGA reduces the viscosity of emulsions, which can be adjusted by increasing the concentration of consistency enhancers such as TEGO® Alkanol 16, 18 or 1618, TEGIN® M or stearic acid or by increasing the concentration of hydrocolloids such as TEGO® Carbomer or Xanthan Gum. TEGO® Carbomer will also prevent water separation of the emulsion that might occur.

Recommended usage concentration

0.1–0.5 %

Applications

TEGO® Cosmo PGA is suitable for O/W and W/O formulations claiming moisturizing benefits.

Packaging

1 kg packing

Hazardous goods classification

Information concerning

- classification and labelling according to regulations for transport and for dangerous substances
- protective measures for storage and handling
- measures in accidents and fires
- toxicity and ecological effects

is given in our material safety data sheets.

This product information is not intended to provide legal or regulatory advice about product uses or claims in any jurisdiction and should not be relied upon for such guidance (especially in the United States, Canada, and Mexico). Since global regulatory requirements differ, parties accessing this information are solely responsible for determining whether the products and/or claims comply with applicable local laws and regulations, including but not limited to import and export regulations. Please contact your local Evonik representative for more product information. Evonik assumes no liability for any use of our products that is not in compliance with the requirements of the country of the user. This product is not intended to be used as a drug.

Guide Line Formulations

Moisturizing Cream (MAC 512/4/23)	
Phase A	
TEGO® Care 450 (Polyglyceryl-3 Methylglucose Distearate)	3.0 %
TEGO® Alkanol 18 (Stearyl Alcohol)	1.5 %
TEGIN® M Pellets (Glyceryl Stearate)	2.5 %
TEGOSOFT® MM (Myristyl Myristate)	1.0 %
TEGOSOFT® DO (Decyl Oleate)	8.0 %
TEGOSOFT® OS (Ethylhexyl Stearate)	9.0 %
Phase B	
Glycerin	3.0 %
Water	67.0 %
Phase C	
TEGO® Carbomer 134 (Carbomer)	0.2 %
TEGOSOFT® OS (Ethylhexyl Stearate)	0.8 %
Phase D	
TEGO® Cosmo PGA (Sodium Polyglutamate)	0.2 %
Water	3.8 %
Phase E	
Sodium Hydroxide (10 %)	q.s.
Phase Z	
Preservative, Parfum	q.s.
Preparation:	
1. Solubilize TEGO® Cosmo PGA in water (phase D).	
2. Heat phase A and B separately to approx. 80 °C	
3. Add phase A to phase B with stirring ¹	
4. Homogenise	
5. Cool with gentle stirring to approx. 60 °C and add phase C.	
6. Homogenise for a short time.	
7. Cool with gentle stirring and add phase D/E below 40° C	
¹⁾ Important: If phase A has to be charged into the vessel first, phase B must be added without stirring	

Moisture Lotion Ultra Nourishing (F 4/08-6)	
Phase A	
TEGIN® 4100 Pellets (Glyceryl Stearate)	0.5 %
Stearic Acid	0.5 %
TEGOSOFT® OP (Ethylhexyl Palmitate)	8.0 %
TEGOSOFT® DEC (Diethylhexyl Carbonate)	4.0 %
TEGOSOFT® CT (Caprylic/Capric Triglyceride)	2.0 %
Xanthan Gum	0.1 %
Phase B	
TEGO® Care CG 90 (Cetearyl Glucoside)	1.0 %
TEGO® Cosmo C 100 (Creatine)	0.5 %
Glycerin	3.0 %
Panthenol	0.5 %
Water	74.4 %
Phase C	
TEGO® Carbomer 141 (Carbomer)	0.3 %
TEGOSOFT® OP (Ethylhexyl Palmitate)	1.2 %
Phase D	
Sodium Hydroxide (10% in water)	q.s.
Phase E	
TEGO® Cosmo PGA	0.2 %
Water	3.8 %
Preservative, Parfum	q.s.
Preparation:	
1. Heat phase A & B separately to approx. 80 °C. 2. Add phase A to phase B with stirring ¹⁾ . 3. Homogenise. 4. Cool with gentle stirring to approx. 60 °C and add phase C. 5. Homogenise for a short time. 6. Cool with gentle stirring and add phase D/E below 40 °C.	
<small>1) Important: If phase A has to be charged into the vessel first, phase B must be added without stirring.</small>	

Time Defence Cream for men (F4/08-2)	
Phase A	
TEGO® Care 450 (Polyglyceryl-3 Methylglucose Distearate)	3.0 %
TEGO® Alkanol 18 (Stearyl Alcohol)	1.0 %
TEGIN® M Pellets (Glyceryl Stearate)	2.0 %
TEGOSOFT® CT (Caprylic/Capric Triglyceride)	10.0 %
TEGOSOFT® OP (Ethylhexyl Palmitate)	5.0 %
TEGOSOFT® DEC (Diethylhexyl Carbonate)	4.0 %
Phase B	
Skinmimics®	5.0 %
Glycerin	3.0 %
Water	62.0 %
Phase C	
TEGO® Carbomer 134 (Carbomer)	0.2 %
TEGOSOFT® OP (Ethylhexyl Palmitate)	0.8 %
Phase D	
Sodium Hydroxide (10% in water)	q.s.
Phase E	
TEGO® Cosmo PGA	0.2 %
Water	3.8 %
Preservative, Parfum	q.s.
Preparation:	
1. Heat phase A & B separately to approx. 80 °C. 2. Add phase A to phase B with stirring ¹⁾ . 3. Homogenise. 4. Cool with gentle stirring to approx. 60 °C and add phase C. 5. Homogenise for a short time. 6. Cool with gentle stirring and add phase D/E below 40 °C.	
<small>1) Important: If phase A has to be charged into the vessel first, phase B must be added without stirring.</small>	

E 08/11

This information and all further technical advice is based on our present knowledge and experience. However, it implies no liability or other legal responsibility on our part, including with regard to existing third party intellectual property rights, especially patent rights. In particular, no warranty, whether express or implied, or guarantee of product properties in the legal sense is intended or implied. We reserve the right to make any changes according to technological progress or further developments.

The customer is not released from the obligation to conduct careful inspection and testing of incoming goods. Performance of the product described herein should be verified by testing, which should be carried out only by qualified experts in the sole responsibility of a customer. Reference to trade names used by other companies is neither a recommendation, nor does it imply that similar products could not be used.
(Status: April, 2008)