

Cosmetic ingredients

Sodium Dextran Sulfate

(DS)



meito sangyo co., ltd.

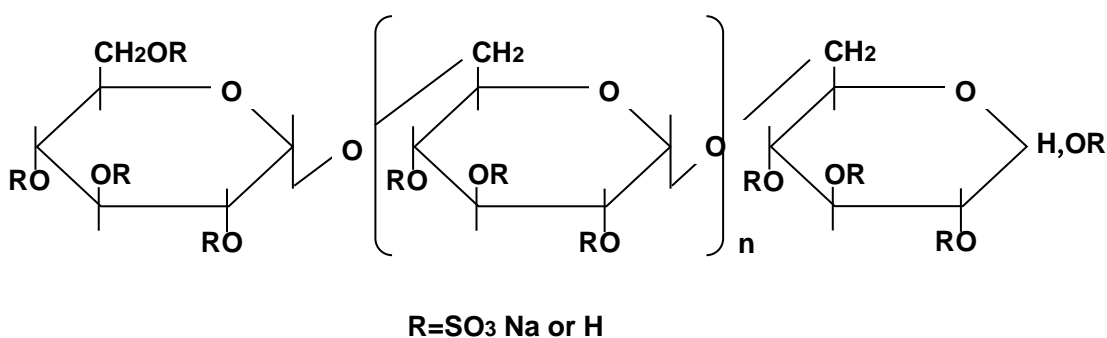
Sodium Dextran Sulfate (DS) is a sodium salt of dextran sulfonate and is a highly safe cosmetic ingredient. As a moisturizer, DS is less affected by humidity and maintains appropriate moisturizing properties even at low humidity. In addition, low-viscosity DS products can be expected to improve blood flow in peripheral blood vessels.

■ Name / structural formula

Ingredient name : Sodium dextran sulfate
 The Japanese standards of quasi-drug ingredients 2021:
 Ingredient Code 006601

INCI : Sodium Dextran Sulfate

CAS : 9011-18-1



■ Product code

Code	Average molecular weight (Dextran used as raw material)	Viscosity
DST-H	ca. 1,500~2,400	Low
DSV-H	ca. 500,000~700,000	High

【Contents】

■ Features	.....	3
Moisturizing	.....	4
Improvement of peripheral blood flow	.....	5
Safety	.....	6
■ Specification	.....	6
■ Package	.....	6
■ Handling precautions	.....	7
■ Reference information	.....	8
Solubility	.....	8
Viscosity characteristics	.....	8
① Concentration	.....	8
② Temperature	.....	9
③ pH	.....	9
④ Sodium chloride	.....	9
⑤ Ethanol	.....	10
⑥ Time course (days)	.....	10
Stability in buffer solutions	.....	11
① pH	.....	11
② sulfate	.....	12
Cosmetic prescription (example)	.....	13
① Lotion	.....	13
② Cream	.....	13
■ Contact	.....	13

■ Features

◎ **Moisturizing**

The water absorption of sodium dextran sulfate is not significantly affected by changes in the ambient humidity. It does not absorb excessive water at high humidity and maintains moderate moisture retention even at low humidity.

⇒ **[Refer to page 4]**

◎ **Improvement of peripheral blood flow**

Applying sodium dextran sulfate (low viscosity product) stimulates peripheral blood vessels to improve blood flow. As a result, it is expected to have an improving effect on swelling due to blood circulation retention.

⇒ **[Refer to page 5]**

◎ **Safety**

Sodium dextran sulfate, which uses dextran with good biocompatibility as a raw material, is a safe product with extremely low toxicity and irritation.

⇒ **[Refer to page 6]**

Moisturizing

The hygroscopicity and moisturizing properties of sodium dextran sulfate were compared with butylene glycol (BG; standard moisturizer) using the water increase rate (%) as an index.

● Test conditions

Sample amount: 1 g

Temperature: 30 °C

Condition-1: Relative humidity (RH) 80 %, 7 days

Measurement: day 1st to 4th and 7th

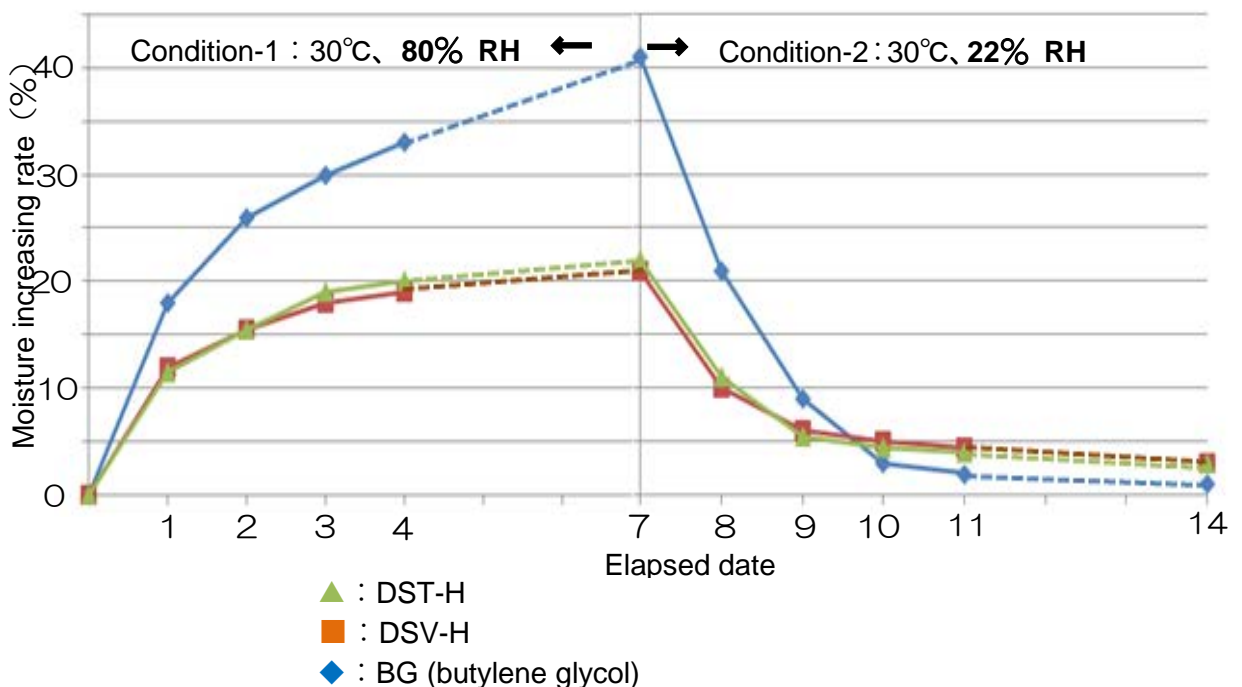
Condition-2: Relative humidity (RH) 22 %, 7 days

Measurement: day 8th to 11th and 14th in total

● Result

BG showed very high hygroscopicity at high relative humidity (condition-1). However, when the relative humidity became lowered (condition-2), the amount of moisturizing decreased sharply, and the difference was very large.

On the other hand, the hygroscopicity of sodium dextran sulfate when the relative humidity was high (Condition-1) did not increase as much as BG. Furthermore, when the relative humidity became low (Condition-2), the rate of decrease in water release was not as large as in BG. Therefore, it was found that the moisturizing property of sodium dextran sulfate is less affected by changes in humidity.



Improvement of peripheral blood flow

Sodium dextran sulfate (low viscosity product: DST-H) has a blood circulation promoting effect by increasing the blood flow of peripheral blood vessels at the application site of the skin.

● Test conditions

Equipment : Laser blood flow meter (Cyber Med, CDF-2000)
Measurement location : Constant temperature room (25 ° C)
No. of subjects : 3
Test preparation : Hydrophilic ointment containing 5% DST-H
Placebo : Hydrophilic ointment

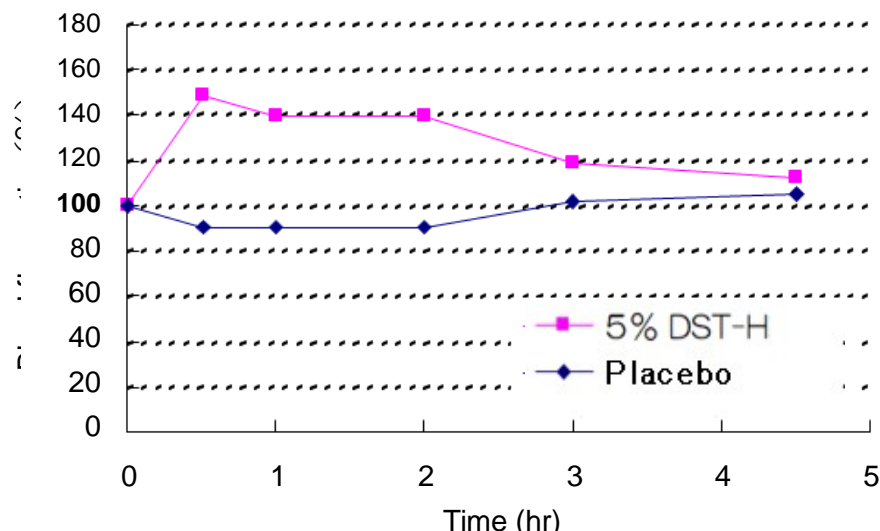
● Test procedure

- a. The blood flow value at the center of the flexion side of the left forearm was measured and used as the pre-application data.
- b. The sample was applied to the center of the flexion side of the forearm, the blood flow value was measured over time, and the blood flow ratio (%) was calculated when the pre-application data was 100.
- c. For the blood flow value, 5 stable points were read from the measured value data and the average was calculated.

● Test results

Blood flow at the site of application of the test preparation was higher than that with placebo, and the effect was observed up to 3 hours later.

Figure-1. Blood circulation promoting effect on skin peripheral blood vessels



In order to investigate the mechanism of action of this phenomenon, the action of DST-H on NO (nitric oxide) production from human epidermal cells was investigated. In addition, the effect of blood circulation promoting action on "edema (swelling)" was tested. A brief explanation is available, so please contact us if you need it.

◎ **Safety**

Sodium dextran sulfate, which uses dextran with good biocompatibility as a raw material, is a safe product. Sodium dextran sulfate is a safe cosmetic ingredient as it is extremely low in toxicity and irritation.

Ocular mucosal irritation	:	Negative (SIRC-NRU)
Skin sensitization	:	Negative (human, 5% aqueous solution)
Mutagenicity	:	Negative (AMES method)
Patch test	:	Negative (human, 5% aqueous solution)

(Sample : DST-H)

■ **Specification (Japanese Standards of Quasi-drug Ingredients 2021)**

Characteristics	:	White to light yellowish white powder, odorless
Identification	Toluidine blue	: Positive
	Anthrone	: Positive
	Sodium salt	: Positive
	IR absorption spectrum	: Specific absorption is observed
pH	:	5. 0 to 7. 5
Optical rotation	:	+ 85 to + 115°
Purity	Chloride	: Not more than 0.36 %
	Sulfate	: Not more than 0.48 %
	Heavy metals	: Not more than 20 ppm
	Arsenic	: Not more than 2 ppm
	Clarity of solution	: Colorless to light yellow, clear
Loss on drying	:	10. 0 % or less
Sulfur content	:	15. 0 to 20. 0 %

■ **Packaging form (example)**

Polyethylene double bag (5 kg packed)
Carton box



Polyethylene double bag (25 kg packed)
Fiber drum



■ **Handling precautions**

- Avoid direct sunlight and humidity, and store in a cool place as much as possible.
- Be careful not to scatter or inhale the powder.
- If you accidentally get the powder in your eyes, wash it thoroughly with water.
- After finishing the work, please gargle, wash your hands, and wash your face.

■ Reference information (solubility, viscosity and formulation examples)

Solubility

Solubility in various solvents (O: soluble, X: insoluble)

Sodium Dextran Sulfate: 10 %

Solvent	DST-H	DSV-H
Water	○	○
Aqueous ethanol (20%)	○	○
Aqueous isopropanol (20 %)	○	○
Aqueous acetone (20 %)	○	○
Acetone	×	×

Sodium Dextran Sulfate: 5 %

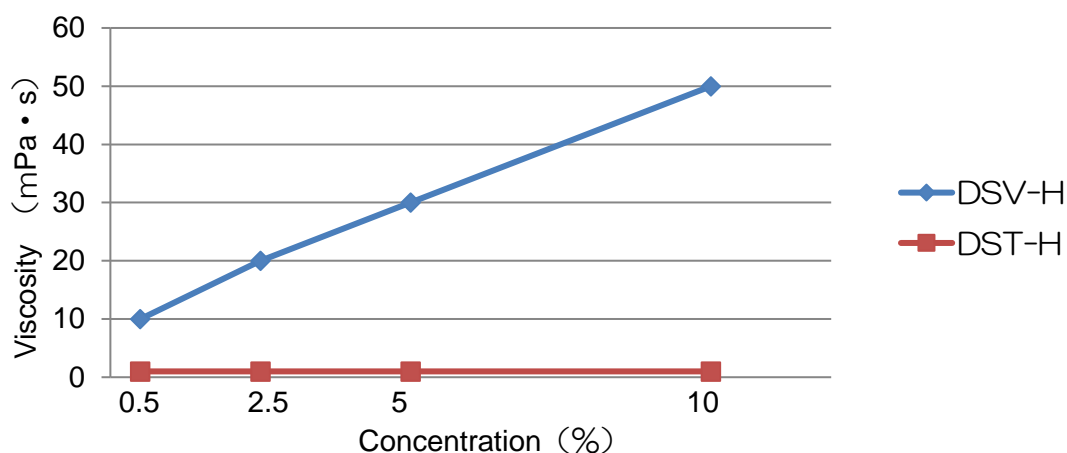
Solvent	DST-H	DSV-H
Aqueous ethanol (30 %)	○	×
Aqueous ethanol (> 30 %)	×	×

Viscosity characteristics

The fluctuation of viscosity under various conditions was shown (using an E-type viscometer).

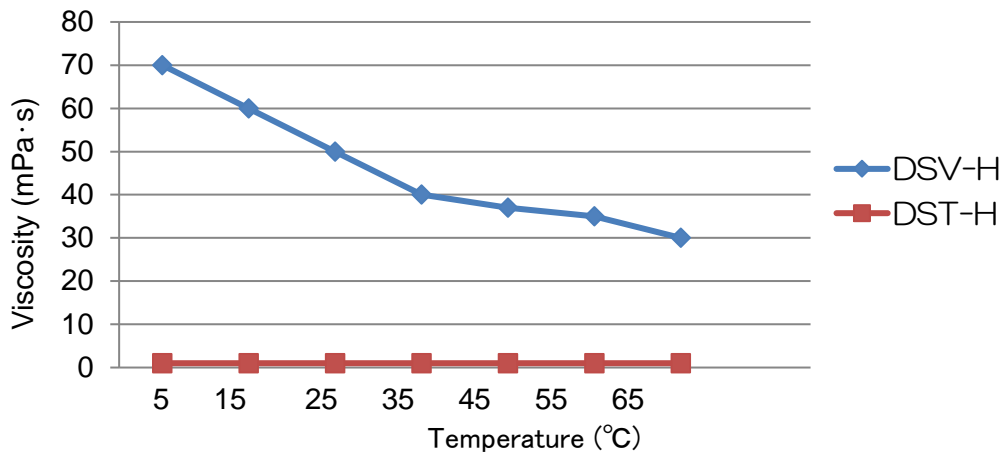
① Concentration (at 25 °C)

DSV-H has a viscosity of about 50 mPa s at a concentration of 10%, while DST-H has a viscosity as low as 1 mPa s at the same concentration.



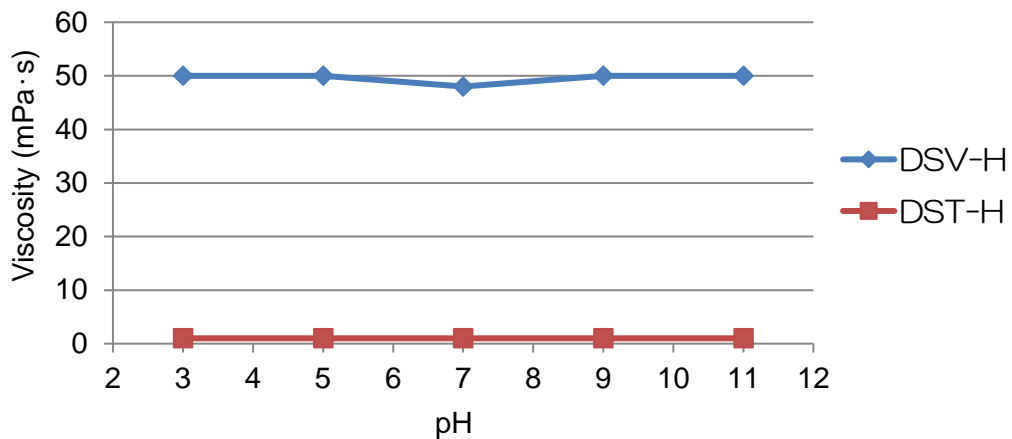
② Temperature (Sodium dextran sulfate: 10 %)

The viscosity of DSV-H decreases as the temperature rises.



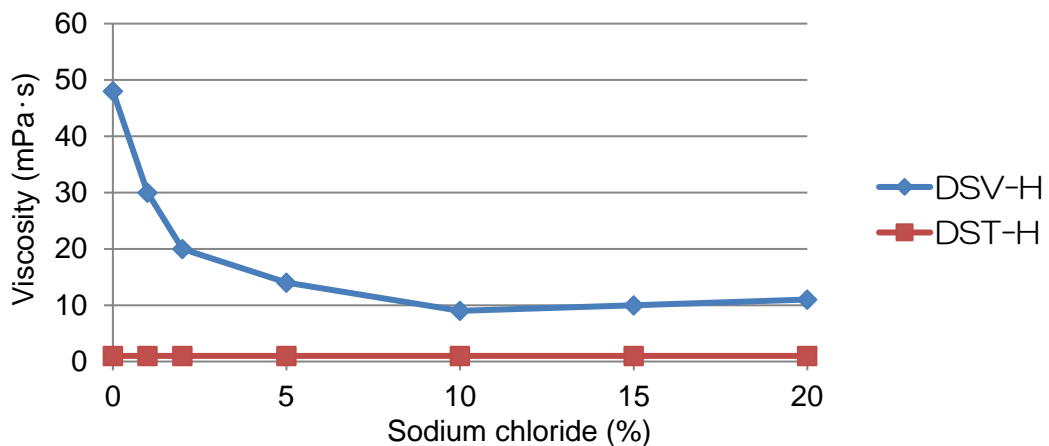
③ pH (at 25 °C, Sodium dextran sulfate: 10 %)

Viscosity hardly changes in a wide range of pH from the acidic side to the alkaline side.



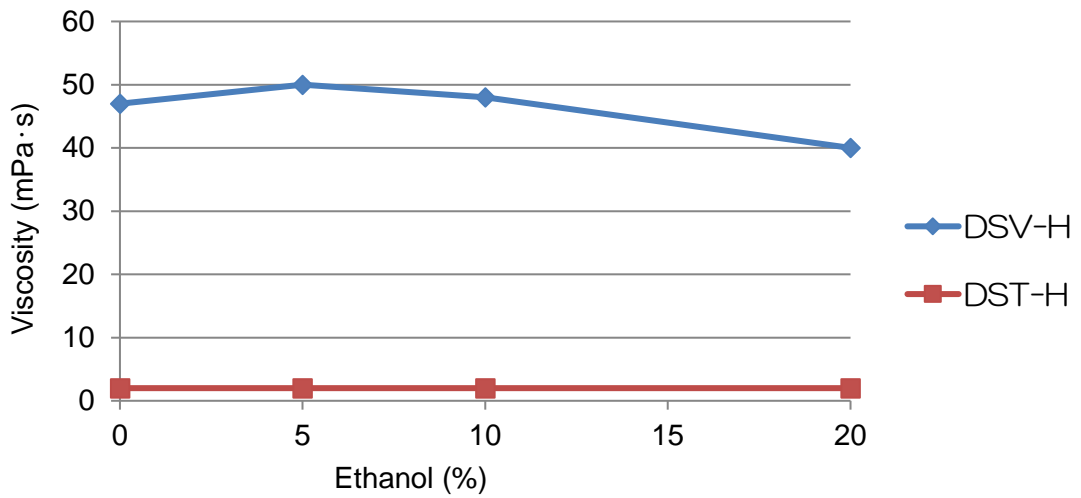
④ Sodium chloride (25 °C, Sodium dextran sulfate: 10 %)

The viscosity of DSV-H decreases when sodium chloride is added.



⑤ Ethanol (25 °C, Sodium dextran sulfate: 10 %)

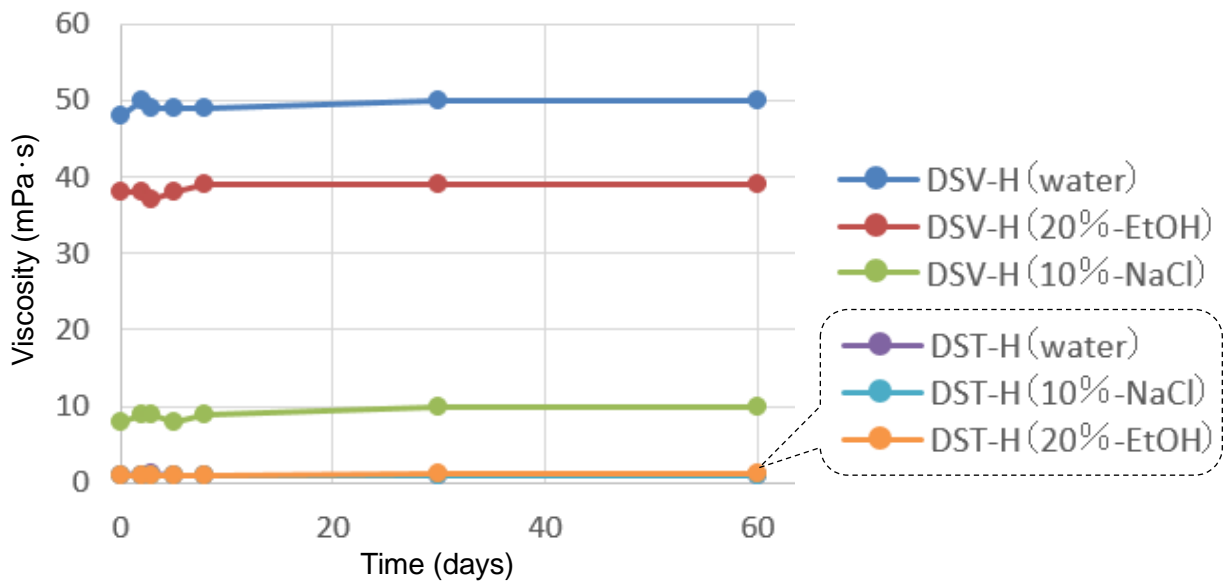
There is almost no change in viscosity due to the addition of ethanol.



⑥ Time course (days) (25 °C, Sodium dextran sulfate: 10 %)

There is almost no change in viscosity with elapsed time.

(Solvent: water, 10% sodium chloride, 20% ethanol)



Stability in buffer solutions

When Sodium Dextran Sulfate (DS) is added to cosmetics, it is expected that DS will be exposed to various pH conditions, so the following experiment was conducted to know the stability of DS under such conditions.

● **Test conditions**

The following four solutions were prepared (DST-H was dissolved in a buffer solution at a ratio of 5%), stored in a chamber for stability test at 25 ° C, and the pH and sulfate values were measured.

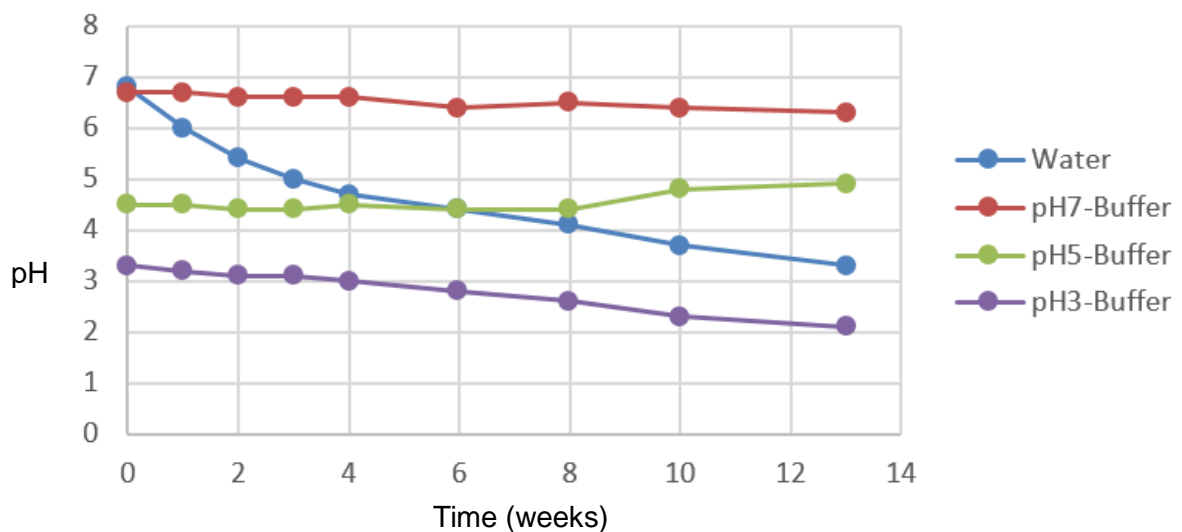
Buffer solution, used	Liquid property
[pH 3 buffer] : 10 mM citrate buffer	Acidic
[pH 5 buffer] : 10 mM citrate buffer	Weakly acidic
[pH 7 buffer] : 10 mM sodium phosphate buffer	Neutral
[water]	Neutral (reference)

● **Result**

When water without buffering capacity or pH3 buffer was used as the solvent, pH decreased and sulfate increased relatively quickly. On the other hand, when pH5 buffer solution or pH7 buffer solution was used as a solvent, almost no change in pH was observed for 3 months or more, and the increase in sulfate was suppressed to a low level. The graphs for each result are shown below.

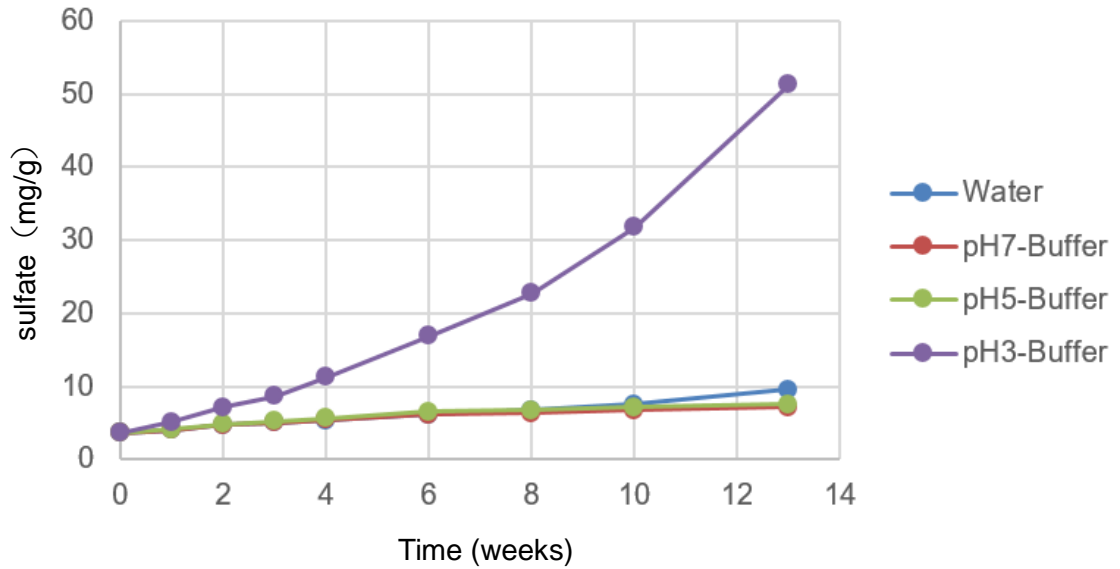
① **pH**

The pH of the aqueous solution gradually decreased immediately after the start of the experiment, but there was no significant change in pH of the pH7 and pH5 buffers. Regarding the pH3 buffer solution, the pH decrease was suppressed until the 6th week, but after that, the pH decrease gradually progressed.



② Sulfate

For the aqueous solution, pH7 buffer, and pH5 buffer, a gradual increase in sulfate was observed, but the changes were the same. Regarding the pH3 buffer solution, sulfate gradually increased from about 2 weeks after the start of the test, and a rapid increase was observed after 6 to 8 weeks.



Cosmetic prescription (example)

① Lotion

Components	:	Ratio (%)
Sodium dextran sulfate	:	1.5
Glycerin	:	10.0
1,3-Butylene glycol	:	5.0
Ethanol	:	10.0
Polyoxyethylene oleyl ether	:	0.9
Methyl paraben	:	0.1
Fragrance	:	0.1
Add purified water	:	Total 100.0

② Cream

Components	:	Ratio (%)
Liquid paraffin	:	8.0
High melting point paraffin	:	13.0
Cetanol	:	4.0
Sorbitan monostearate	:	1.9
Polyoxyethylene sorbitan monostearate	:	3.1
Sodium dextran sulfate	:	1.5
Glycerin	:	5.0
1,3-Butylene glycol	:	3.5
Add purified water	:	Total 100.0

■ Contact

For inquiries regarding this product, please contact the following.

Meito Sangyo Co., Ltd.

Fine Chemicals Sales Department

ISSEI BUILDING Annex 2F, 1-18-2, Akebono-cho, Tachikawa, Tokyo, 190-0012, Japan

TEL : +81-42-548-5535, FAX : +81-42-548-5537

<http://www.meito-sangyo.co.jp>

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