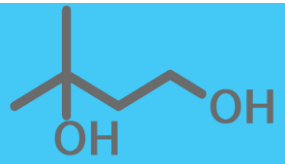
Introduction of Isoprene Glycol (IPD)

’18/01/29





What is IPD ?



Chemical Name	:	3-methyl-1,3-butanediol
INCI name	:	Isopentyldiol
CAS Number	:	2568-33-4
Production Site	:	Kashima Plant of Kuraray
Basic Features	:	Transparent appearance, Low odor, High purity

Performances

- Moisturizing
- Solubilizing
- Assisting Preservative
- Hand-feel modifying
- Synergy effects with other ingredients
- High Safety

Multifunctional & Well-balanced Material

Production Site

IPD was launched in 1991 in Japan.
It's produced at Kashima Plant.
Petroleum-derived Polyol.

Applications

Cosmetics

＜Hair care＞

- Conditioner
- Treatment
- Shampoo
- Hair styling

＜Skin care＞

- Cleanser
- Facial wash
- Lotion, Cream
- Facial mask
- Body wash
- Sunscreen

＜Color cosmetics＞

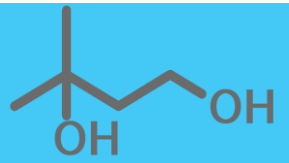
- Lip stick
- Eye shadow
- Powder Foundation

Others

- Home care products, Bath additive, Ink, Extraction solvent, and so on…

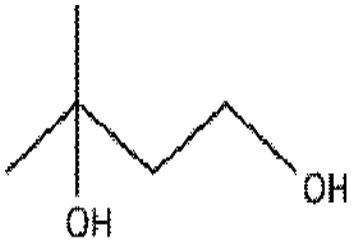
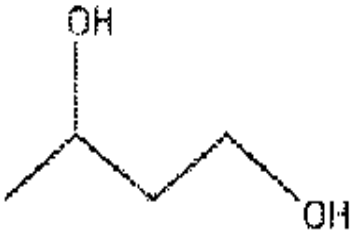
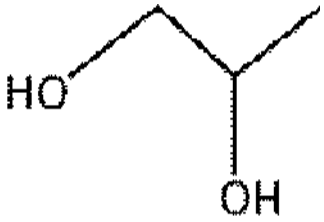
Widely introduced in cosmetics & toiletry products

Physical Properties

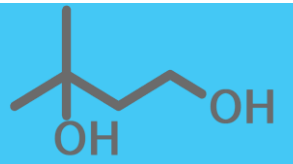


- Formula : C5H12O2
- Component : 100% of IPD
- Origin : Petroleum
- Boiling Point : 203℃
- Flash Point : 116℃
- Freezing Point : < -50℃
- Viscosity : 250mPa･s (20℃)
- Surface Tension : 70.0mN/m (1g/L solution)

Comparison with Other Polyols

	IPD	1,3-BG	1,2-PG	DPG
Chemical Structure				
Molecular Weight	104	90	78	76
Specific Gravity	0.979(20/20℃)	1.006(20/20℃)	1.038(20/20℃)	1.038(20/20℃)
Boiling Point	203℃	207℃	188℃	187℃
Freezing Point	<-50℃	-77℃	-59.5℃	<-50℃
Flash Point	105℃(Closed)	121℃(Opened)	97℃(Closed)	99℃(Closed)
Viscosity (CPS)	253(20℃)	104(25℃)	56(20℃)	43(25℃)
Water Solubility	∞	∞	∞	∞

Safety Data



- Acute Toxicity (Oral) : LD50：≧5,000mg/kg(Mice)
- Irritation (Skin) : Negative（Rabbits）
- Irritation (Eye) : Negative（Rabbits）
- Repeat Dose Irritation : Negative（Guinea pigs, 28days）
- Skin Sensitization : Negative（Guinea pigs）
- Photo Irritation : Negative（Guinea pigs）
- Photo Sensitization : Negative（Guinea pigs）
- Genotoxicity : Non-mutagenic for S.typhimurium, E coil（Ames test）
- Patch Test (Human Skin) : Negative
- Toxicity to Fish : LC50：>103mg/L(Rainbow trout)
- Biodegradable : Good degradable（OECD 301C）

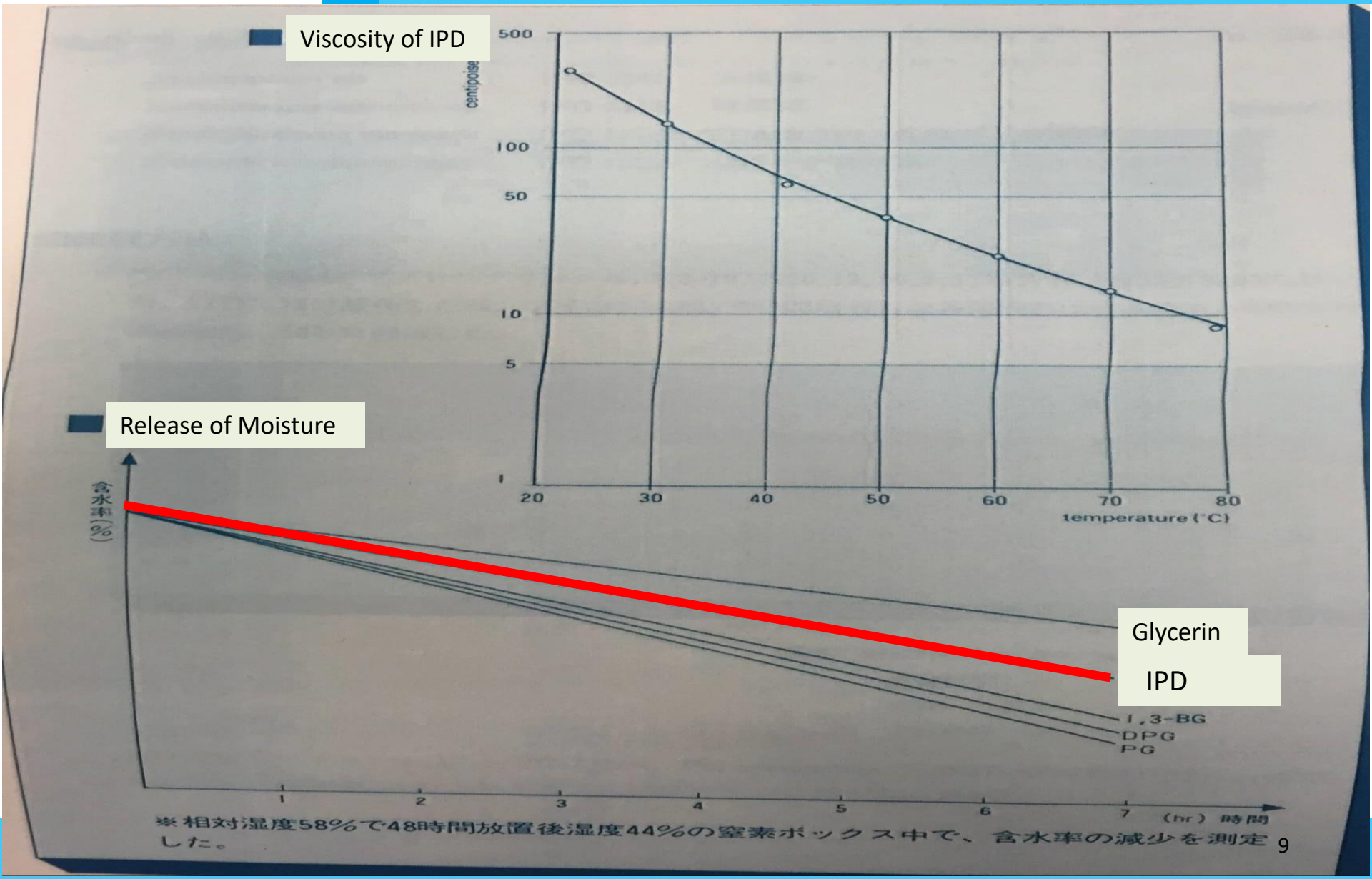
These data was obtained before the prohibition of animal test.

High Safety and Eco-friendly Product

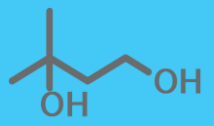
Technical Data

- Moisturizing property
- Solbilizing property
- Bacteriostatic
- Cleansing property
- Dispersion in O/W emulsion
- Hair repairing property

Moisturizing Property



Moisturizing Property with Sorbitol



Water Measurement by Corneometer（5 panelists）

＜Cream＞

- “Basic Cream” without moisturizer
- “Basic Cream” + IPD 5%
- “Basic Cream” + IPD 5% + Sorbitol 5%
- “Basic Cream” + Hyaluronate sodium 0.5%

Test formula (white cream)	
Active	**0 or x %**
Ultrez 10 (carbomer)	0.75%
Lanette 16 (cetyl alcohol)	1%
Cithrol GMS (Glyceryl stearate/PEG 100 stearate)	3%
Parrafin oil AAB2 (Paraffinum liquidum)	3%
Triethanolamine	0.6%
Germaben II	0.7%
Deionised water	qsp 100%

＜Procedure＞

1. Wash 10 spots of application with lauryl sulfate sodium solution and dry.
1. Measure amount of moisture before application.
2. Using every peace of cream 0.1g each. Apply to same spots on skin.
3. Measure amount of moisture at the each following timing.

＜Measurement Timing＞

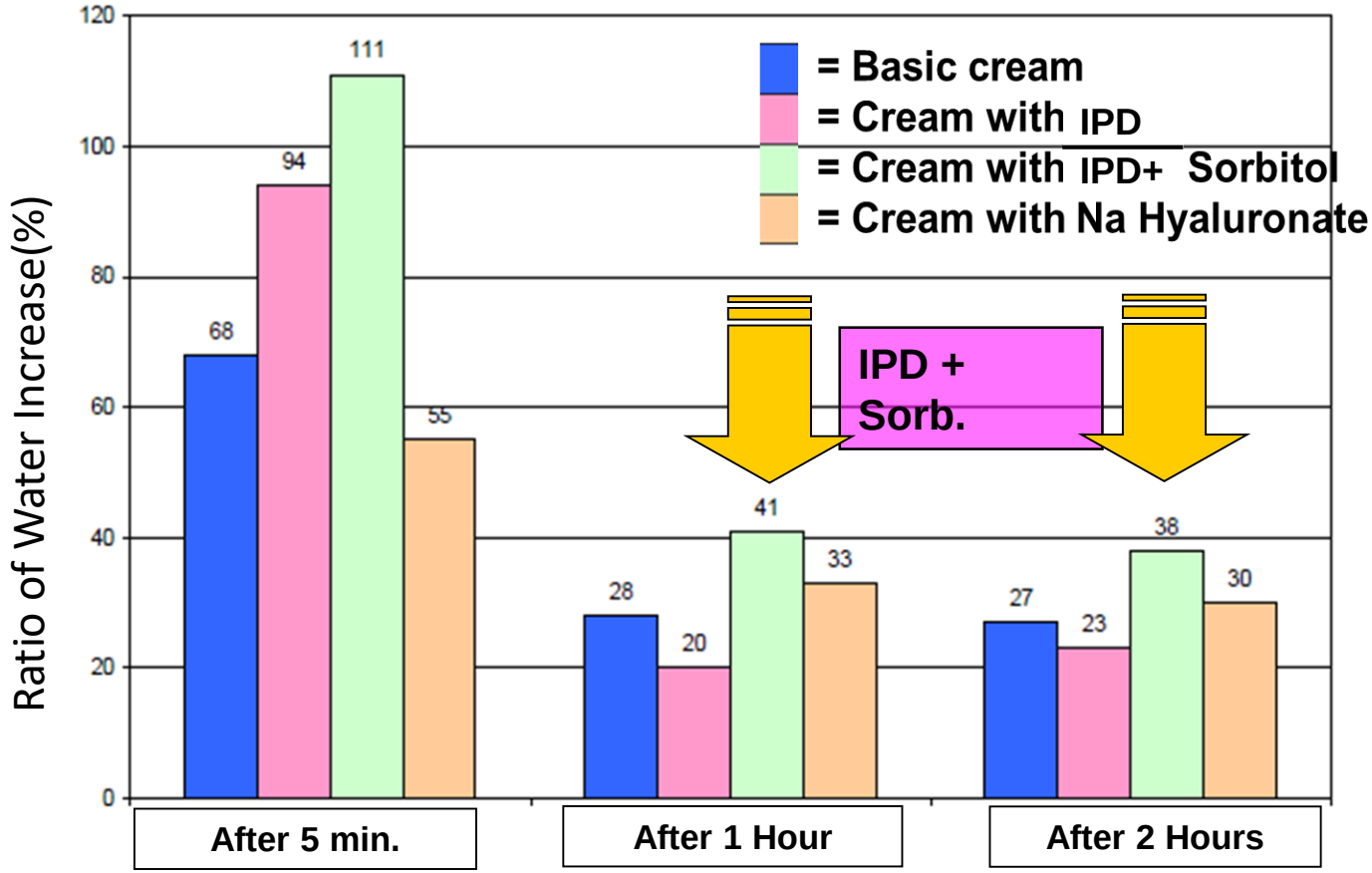
① Before application　② 5m later　③ 1h later　④ 2h later

Moisturizing Property with Sorbitol

Ratio of Water Increase in Comparison with before Application

Positive effect

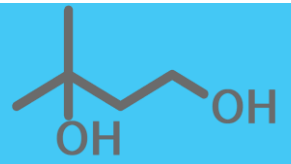
No effect



Combination with sorbitol can increase moisturizing effect.

The test was conducted by Irfaq（France）.

Solbilizing Property

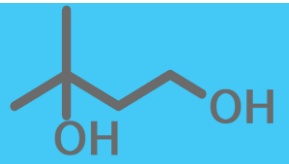


Solute	Solubitility		
	IPG	1,3-BG	PG
Water	>100	>100	>100
Ethanol	>100	>100	>100
Cetanol	>100	>100	>100
Stearic acid	>100	>100	>100
Olive oil	0.4	0	0
Glycerin monostearate	>100	>100	>100
Glycerin tristearate	2	0	0
Cetyl ethylhexanoate	2.7	1	0.6
Trimethylstearylammonium chloride	>100	>100	>100
POE(20) sorbitan mono stearate	>100	69	>100
Sodium POE lauryl ether sulfate	>100	>100	>100
Sodium lauryl sulfate	>100	65.4	>100
Liquid paraffine	1.2	0	0
Squalane	0.8	0	0

・・・Where IPD shows higher solubility than others

IPD can be useful to solubilize difficult actives.

Bacteriostatic



【Escherichia coil】

Percentage (W/V%)	IPG	1,3-BG	DPG	PG
15	−	−	±	−
12.5	−	−	±	±
10	−	±	±	+
7.5	±	+	+	+
5	+	+	+	+

【Pseudomonas aeruginosa】

Percentage (W/V%)	IPG	1,3-BG	DPG	PG
8	±	±	+	±
6	±	±	+	+
4	±	+	+	+
2	+	+	+	+
1	+	+	+	+

【Staphylococcus aureus】

Percentage (W/V%)	IPG	1,3-BG	DPG	PG
20	−	−	±	−
18	±	±	+	±
16	+	+	+	+
14	+	+	+	+
12	+	+	+	+

＋・・・Growth
±・・・Slightly growth
−・・・No Growth

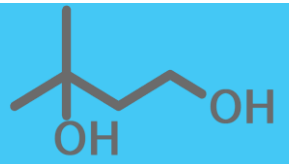
【Candida albicans】

Percentage (W/V%)	IPG	1,3-BG	DPG	PG
27.5	−	−	−	−
25	−	−	±	−
22.5	±	±	±	±
20	±	±	±	±
17.5	±	±	±	±

【Stachybotrys chartarum】

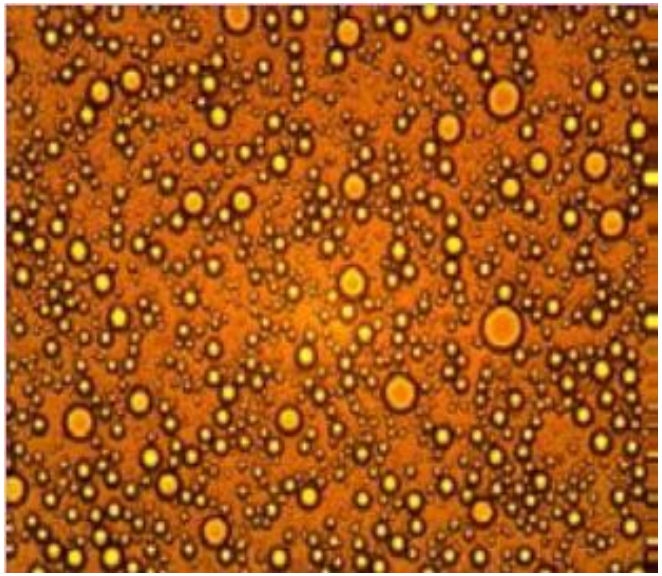
Percentage (W/V%)	IPG	1,3-BG	DPG	PG
25	−	−	−	−
22.5	±	−	−	−
20	±	−	+	−
17.5	+	±	+	−
15	+	±	+	−

Dispersion in O/W Emulsion

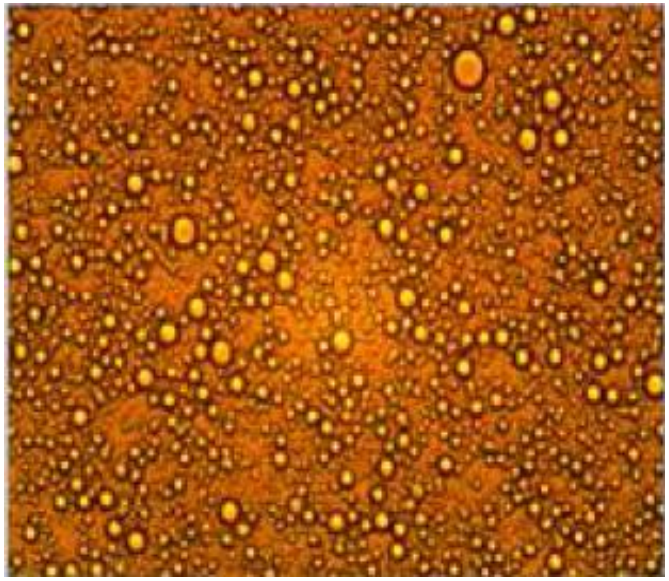


- Comparison of O/W type cream between with IPD in water phase and without IPD

＜Without IPD＞



＜With IPD＞

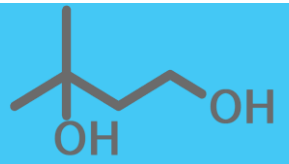


O/W emulsion with or without IPD* (qsp water)	
Water	73,50%
Hydrogenated Polydecene	20,00%
Steareth 2	3,00%
Steareth 21	1,00%
Cetearyl alcohol	1,50%
Preservative	1,00%

: 5% incorporated in the water phase

IPD helps uniform dispersion

Cleansing Property



Sensory Assessments of Cleansing Performance of Glycols by 4 Volunteers

＜Before＞

- Prepare 4 types of 10% water solution of the following polyols

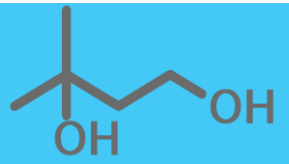
① IPG ②Monopropylene Glycol ③Butylene Glycol ④Dipropylene Glycol

＜Procedure＞

1. Wash face with a 25% lauryl sulfate sodium solution.
2. Rinse with tap water.
3. Dry with terry towel.
4. Wait for 15 minutes to rebalance skin.
5. Apply liquid foundation and lipstick evenly on each side.
6. Wait for 10 minutes to let make-up dry.
7. Apply 1.0±0.1g test solution on make-up remover pads.（4types）
8. Use pads 10times each to remove, foundation and lipstick respectively.

The test was conducted by Irfaq（France）.

Cleansing Property



Sensory Assessment by 4 Volunteers

Bad←1～8→Good		IPD (10%)	1,2-PG (10%)	1,3-BG (10%)	DPG (10%)
Performance as make-up remover	Foundation	5	5	3	5
	Lipstick	8	6	7	7
Skin freshness		7	5	6	5
Absence of stickiness		8	8	6	7
Skin softness after make-up removal		8	8	7	7

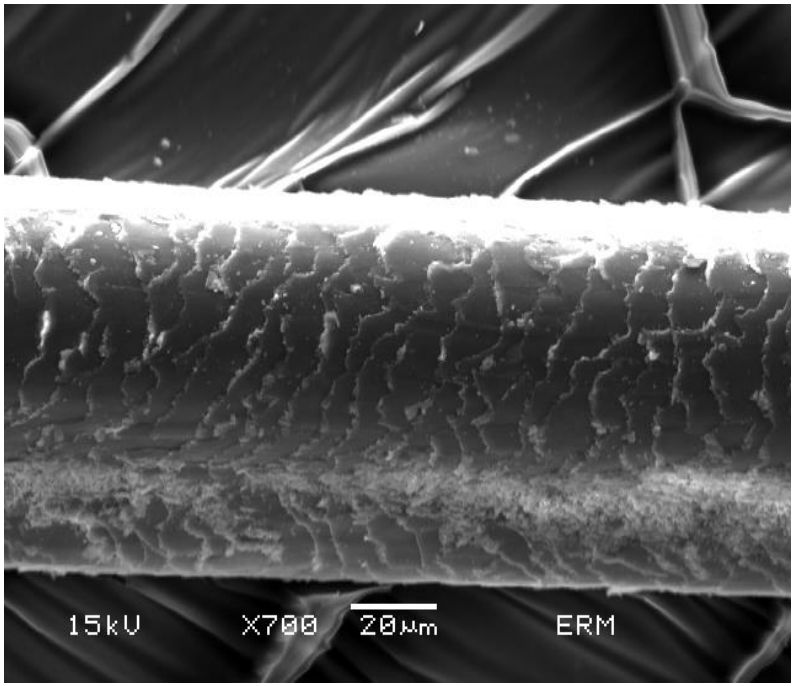
Higher performance in terms of cleansing and its feeling

The test was conducted by Irfaq（France）.

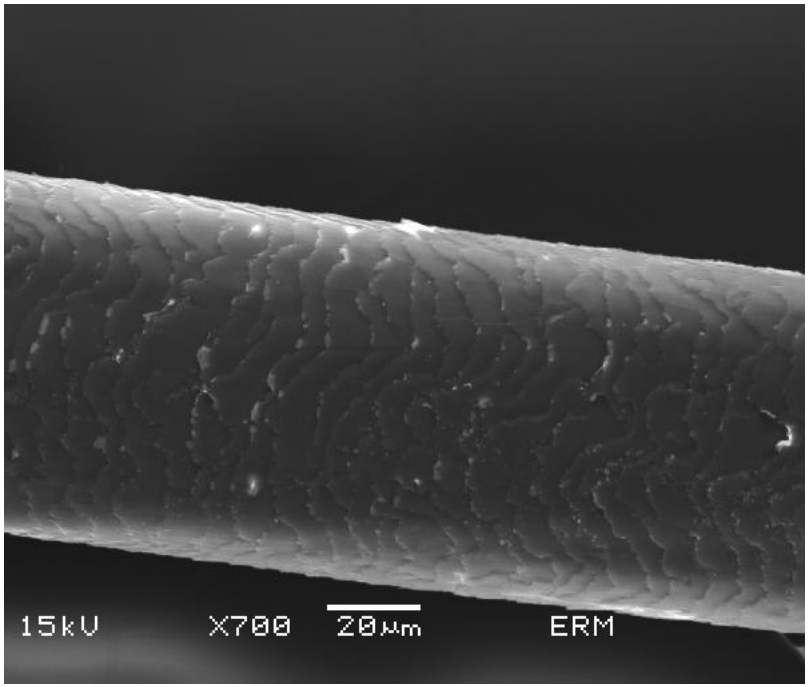
Repair Effect on Damaged Hair

Soaking hair in the solution(5%IPG+5%Sorbitol) for 30minutes.
Comparison photo of pre-treatment and post-treatment.（×700）

Before



After



The test was conducted by Irfaq（France）.

Repair Effect on Damaged Hair

RING SLIDE TEST

＜Preparation＞

1. Soak two bundles of hair in 10% ammonia solution for 30 minutes.
2. Soak for 15 minutes in tap water.
3. Rinse with tap water flow for 30 seconds.
4. Wipe off the moisture with a towel and dry for 5 minutes.

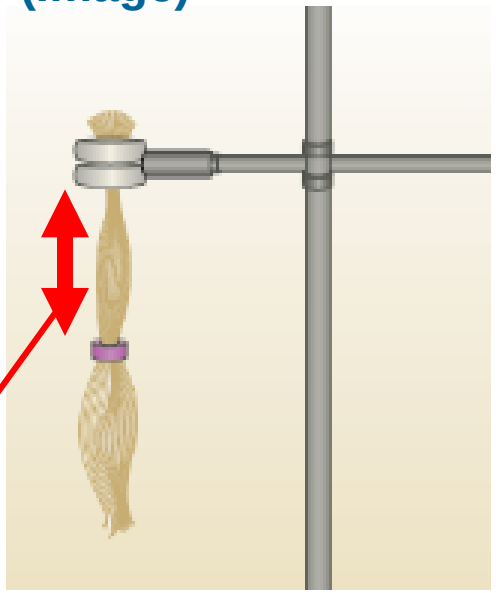
3 types of solution are used:
①5%IPG+5%Sorbitol　②10%IPG　③10%Sorbitol

＜Procedure＞

1. Soak two bundles of hair in the three types of solution. (3min, 10min each)
2. Rinse with tap water for 30 seconds, dry for 5 minutes.
3. Clip a bunch of hair to a height of 30cm.
4. Release the ring(6g) from above, record the fallen distance.
5. Repeat five times on each to graph the average.

Record the fallen distance

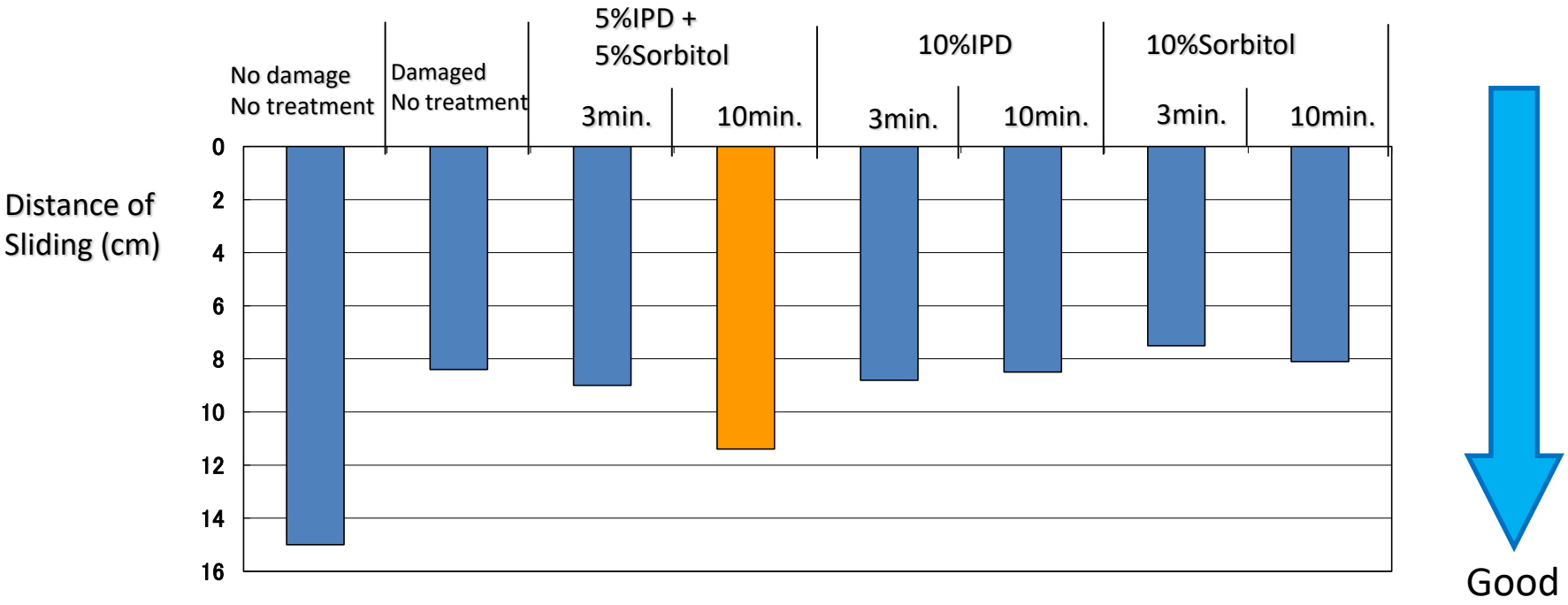
(Image)



The test was conducted by Irfaq（France）.

Repair Effect on Damaged Hair

Comparison of Hair Repairing Effect



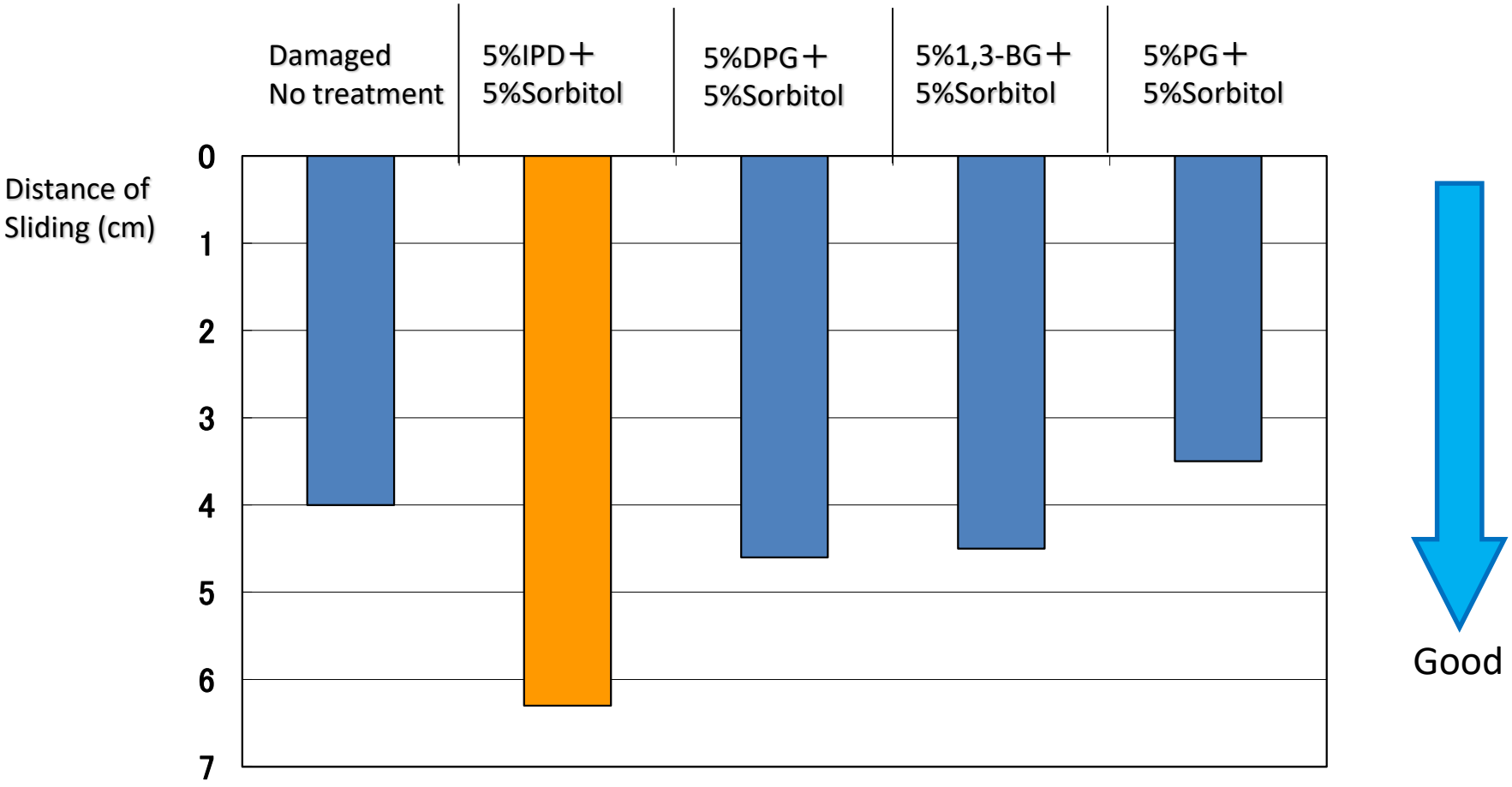
＜Result＞

The solution (5%IPD + 5%sorbitol, soaked 10minutes) showed the best result.
⇒IPD can be effective to repair damaged hair in combination with sorbitol.

The test was conducted by Irfaq（France）.

Repair Effect on Damaged Hair

Comparison between IPD, 1,3-BG, 1.2-PG, and DPG

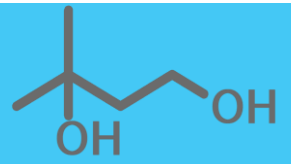


The test was conducted by Irfaq（France）.

Appendix

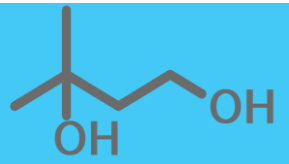
- Specifications
- Regulatory Status
- Content Rate in Cosmetics Products

Specifications



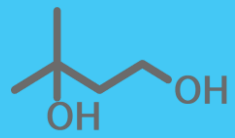
➢ Appearance	:	Colorless Liquid
➢ Specific Gravity（20/20℃）	:	0.974~0.982
➢ Refractive Index（20℃）	:	1.440~1.446
➢ Purity（%）	:	≧ 99.0
➢ Water	:	≦ 1.5
➢ Content（% Purity - Water）	:	≧ 97.0
➢ Acid Value（KOH　mg/g）	:	≦ 1.0
➢ Ignition Residue（%）	:	≦ 0.05
➢ Heavy Metal（ppm）	:	≦ 5
➢ Arsenic（ppm）	:	≦ 2

Regulatory Status



✓ CRC-SEPA (China)	: Listed
✓ CFDA (China)	: Listed (7841)
✓ NDSL (Canada)	: Listed
✓ ECL (Korea)	: Listed (KE-23542)
✓ ELINCS (EU)	: Listed (459-270-7)
✓ REACH	: Registered
✓ ENCS (Japan)	: Listed (2-240)
✓ PICCS (Philippine)	: Listed
✓ Swiss (Swiss)	: Listed (290800)
✓ CTFA (US)	: Listed
✓ ECN (Taiwan)	: Listed
✓ AICS (Australia)	: Listed

Content Rate in Cosmetics Products



Example

- Hair conditioner : 4～6%
- Hair treatment : 5～7%
- Cleanser : 4～10%
- Facial wash : 4～5%
- Body wash : 1～5%
- Hair styling : 2～5%
- Cream : 1～3%
- Hand wash : approx. 10%