Advanced Metal-Soap Powder for Makeup Applications “Achieving a Viable Alternative to Talc”

IWASE COSFA Co., Ltd.

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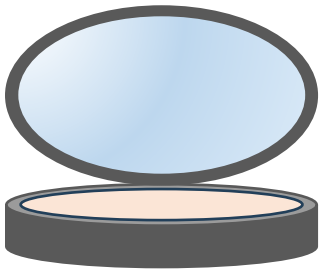
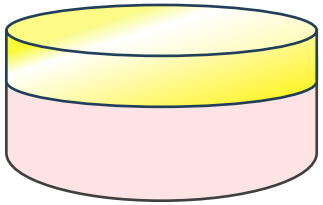
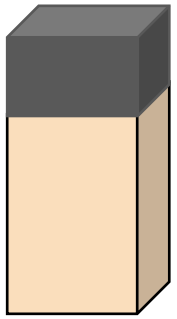
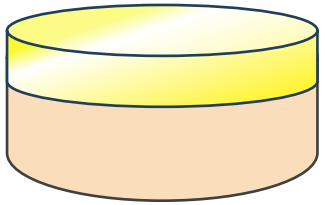
Why is Talc so important ?

Powder	Ingredients		wt.%
Powder Foundation 	Extender pigments	**Talc**	~30%
		Others	~40%
	Functional Powders	Colored/ Pearlescent pigments, Functional Powders, etc.	~15%
Face Powder 	Oils Others	Oils / Emollients, UV Absorbers, Preservatives, Stabilizers, Extracts, etc.	~15%

Liquid	Ingredients		wt.%
Liquid Foundation 	Extender pigments	**Talc**, Others	~5%
	Functional Powders	Colored/ Pearlescent pigments, Functional Powder UV Filters etc.	~15%
Cream Foundation 	Oils Others	Oils / Emollients, UV Absorbers, Preservatives, Stabilizers, Extracts, etc.	~40%
	Water, Moisturizers	Purified Water, Moisturizers, Water-soluble, Thickeners	~40%

Why is Talc so important ?

Talc possesses a unique combination of physical properties that are difficult to replicate with other raw materials.

1. Superior Functional Properties

- Platelet Structure : provides a smooth, "silk-like" glide and excellent skin adhesion.
- High Translucency : offers a natural finish without excessive whitening (low opacity).
- Mattifying Effect : effectively absorbs excess sebum and sweat.

2. Physical & Chemical Stability

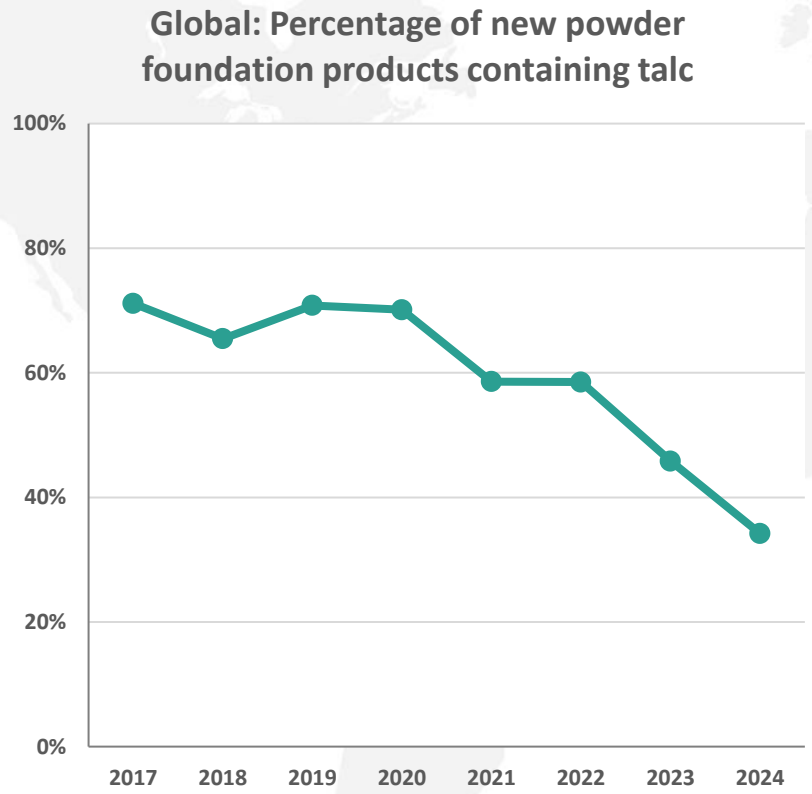
- Inertness : Chemically stable and compatible with various cosmetic ingredients (oils, pigments, fragrances).
- Softness : The world's softest mineral (Mohs hardness of 1), ensuring no skin irritation or abrasion.

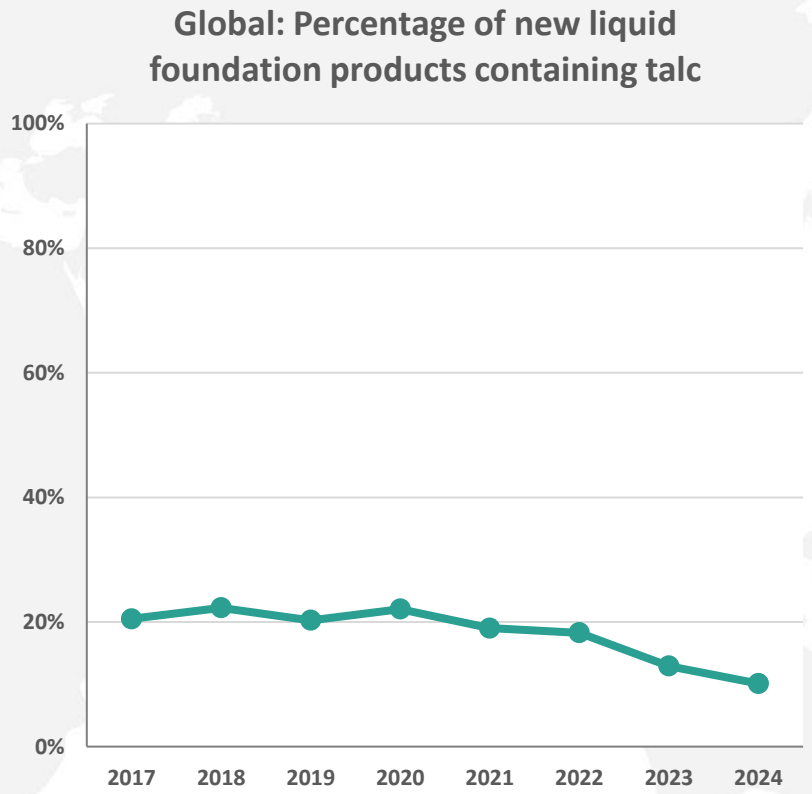
3. Industrial Advantages

- Ease of Formulation : Versatile across powder, liquid, and cream formats.

Background: The Accelerating "Talc-Free" Trend and Market Reality

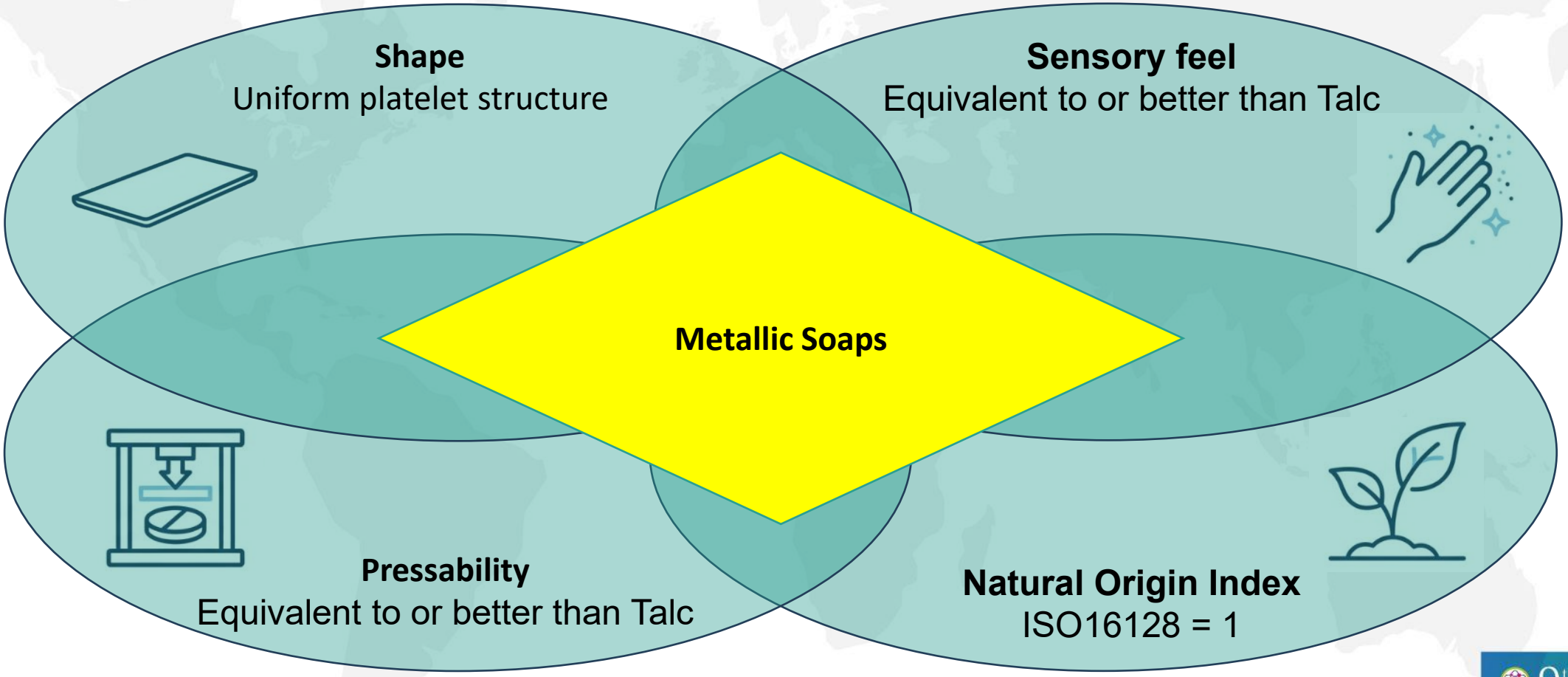
Global Trend: The usage of talc in foundations is steadily declining.
Urgent Task: Exploring alternative raw materials to address ongoing asbestos-related safety concerns.





Required Conditions for Talc Alternatives

Challenge : Four Essential Requirements for Ideal Talc Alternatives
Beyond being a mere extender, the material must deliver functional performance equivalent to or exceeding that of talc.



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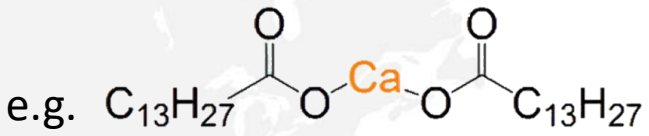
What is Metallic Soap?

Metallic Soap

e.g. 

- Softness equivalent to general extender pigments
- Superior quality stability with minimal shape variation
- Eco-friendly, plant-derived ingredients (e.g., vegetable fatty acids)
- Proven safety with long-term use in cosmetics
- Multi-functional: Improves dispersion, lubricity, gloss, and texture

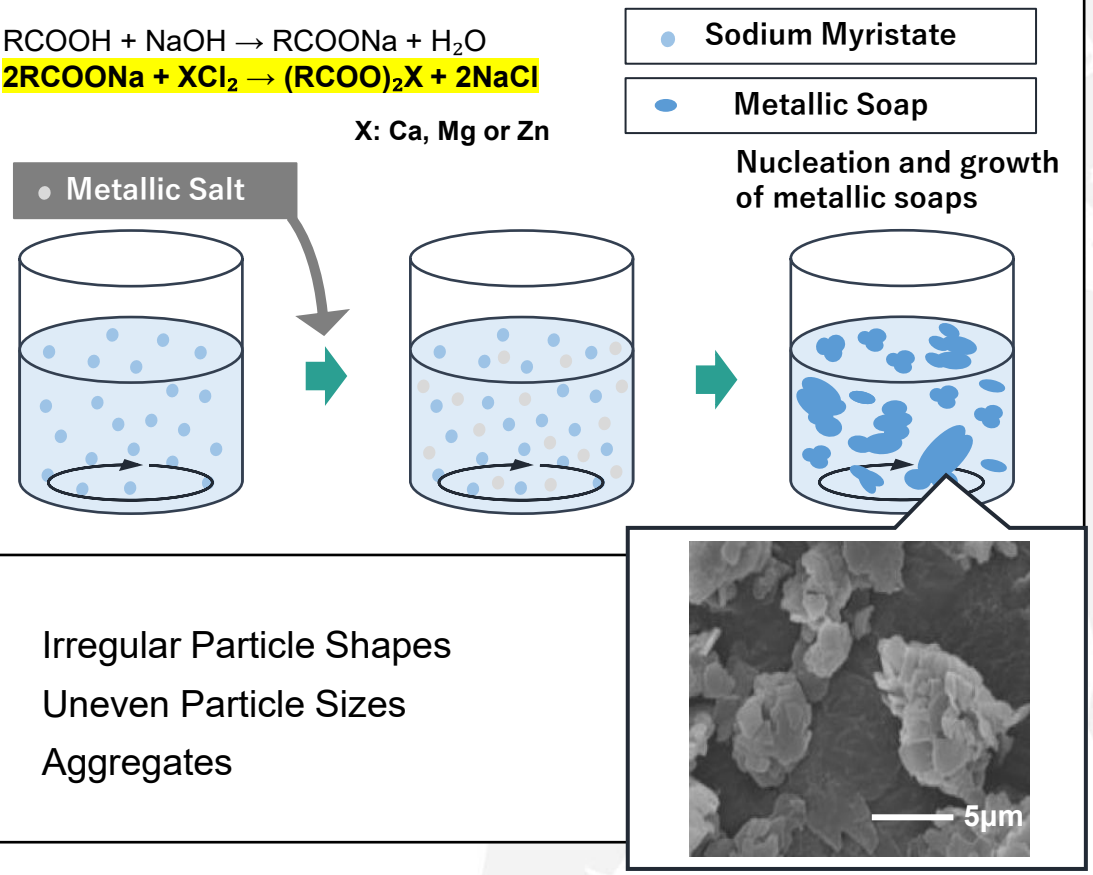
Method for Producing Metallic soap

Metallic soaps produced by conventional methods

$RCOOH + NaOH \rightarrow RCOONa + H_2O$

$2RCOONa + XCl_2 \rightarrow (RCOO)_2X + 2NaCl$

X: Ca, Mg or Zn



- Irregular Particle Shapes
- Uneven Particle Sizes
- Aggregates

Cause: Particle irregularity and increased oil absorption

Effect: Poor pressability and diminished sensory feel

A new process using plate-like glass

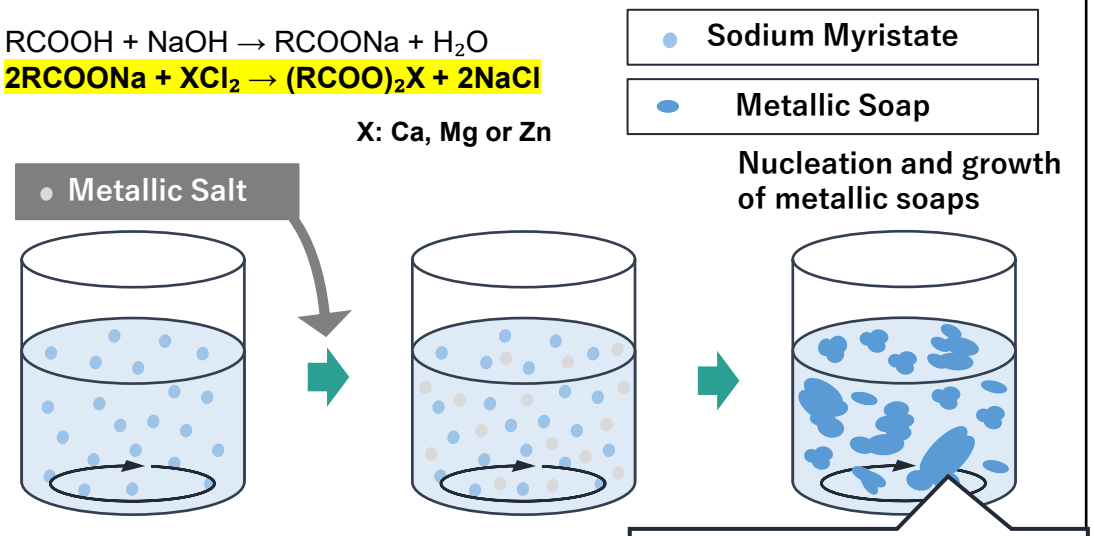
Composite metallic soaps produced by the novel methods

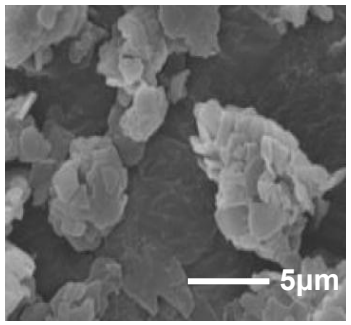
Metallic soaps produced by conventional methods

$RCOOH + NaOH \rightarrow RCOONa + H_2O$

$2RCOONa + XCl_2 \rightarrow (RCOO)_2X + 2NaCl$

X: Ca, Mg or Zn





- Irregular Particle Shapes
- Uneven Particle Sizes
- Aggregates

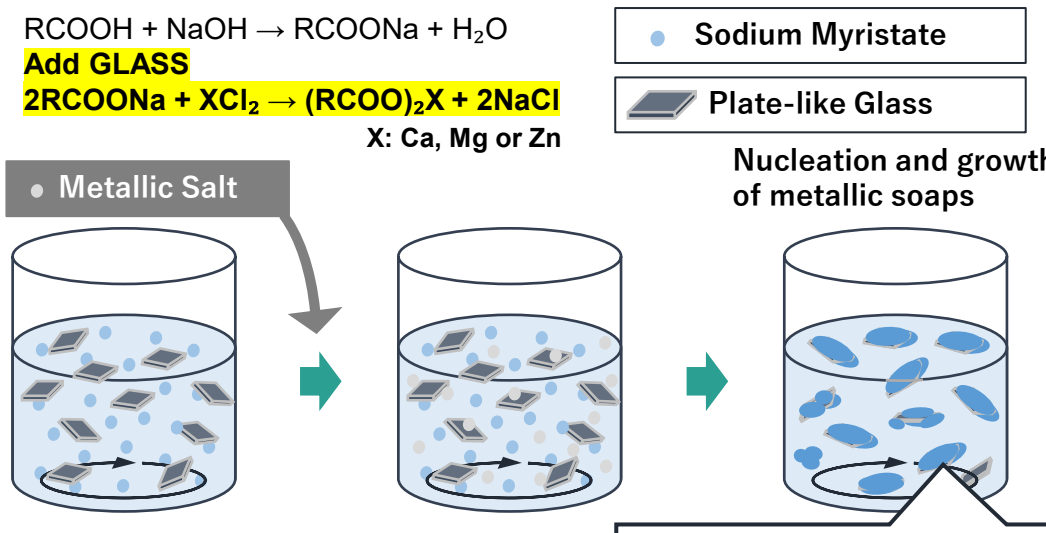
Composite metallic soaps produced by the novel methods

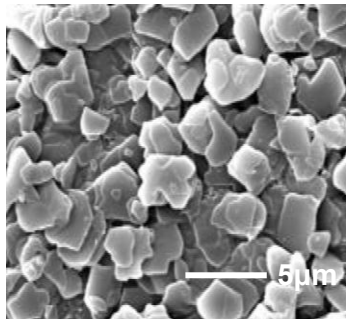
$RCOOH + NaOH \rightarrow RCOONa + H_2O$

Add GLASS

$2RCOONa + XCl_2 \rightarrow (RCOO)_2X + 2NaCl$

X: Ca, Mg or Zn

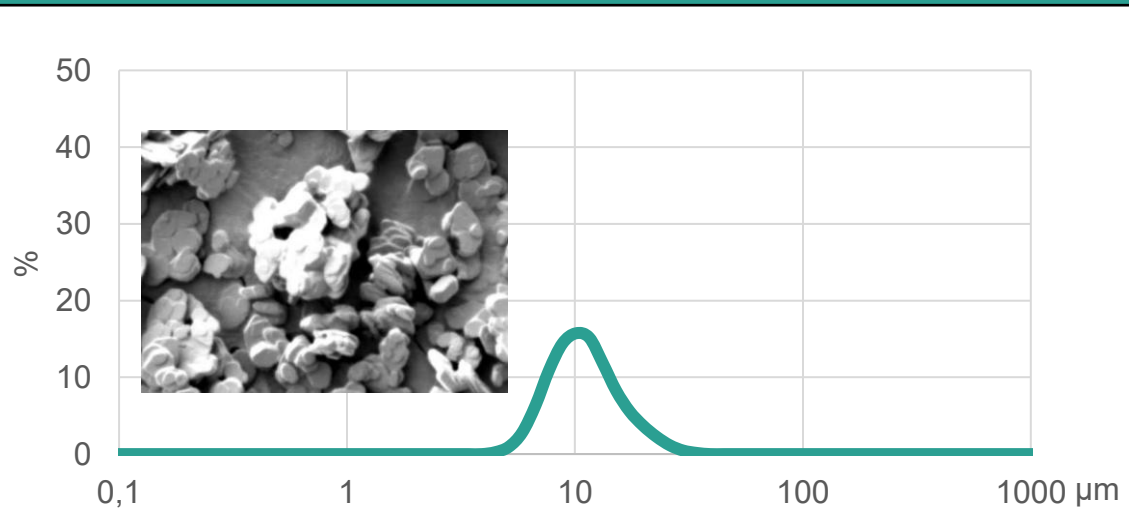
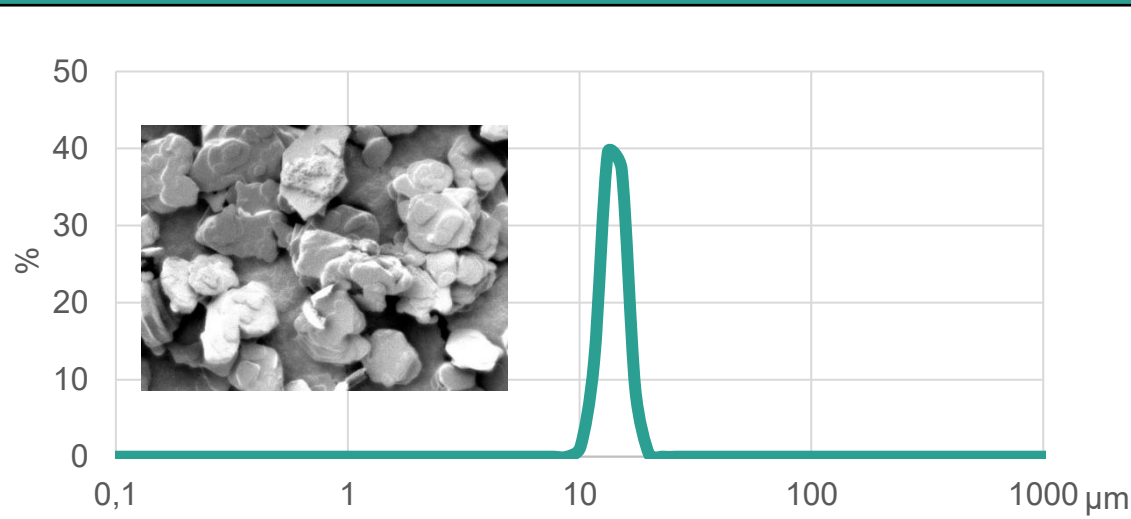




- Uniform Plate-like Shape
- Uniform Particle Size
- Free of aggregation

Particle Distribution

The average particle size of the composite powder was more uniform compared to that of conventional metallic soaps. This uniform composite state suggests that the plate-like glass effectively controls the particle growth of the metallic soap.

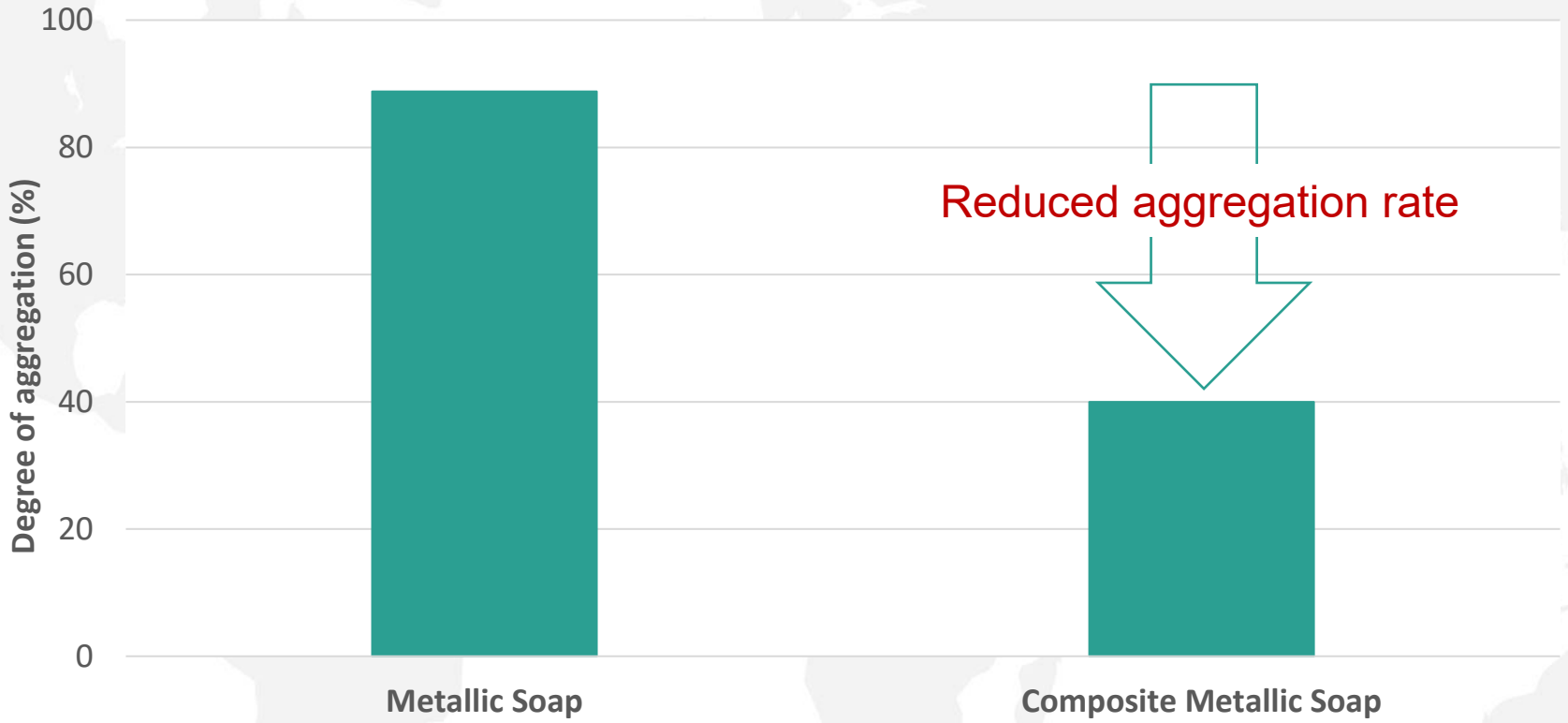
Metallic soaps produced by conventional methods	Composite metallic soaps produced by the novel methods
	

Method

The particle morphology of the composite powder was observed using a scanning electron microscope (SEM) (JEOL JSM-IT300HR). Additionally, changes in particle size were measured using a laser diffraction/scattering particle size distribution analyzer (HORIBA LA-950).

Aggregability

The degree of aggregation for the pure metallic soap was 88.8%, whereas that of the composite powder was significantly improved at 40.0%. A remarkable effect in suppressing aggregation was confirmed.



Method

The degree of aggregation was measured using a powder characteristic tester (Hosokawa Micron PT-X). A three-tier sieve system (apertures: 150 µm, 250 µm, and 355 µm) was subjected to specific vibrations for a predetermined period. The degree of aggregation (%) was calculated from the mass of powder remaining on each sieve using the following equations: Degree of Cohesion (%) = X + Y + Z,
X= (Mass of powder remaining on the top sieve) / 2 × 100,
Y= (Mass of powder remaining on the middle sieve) / 2 × 100 × 3/5,
Z= (Mass of powder remaining on the bottom sieve) / 2 × 100 × 1/5

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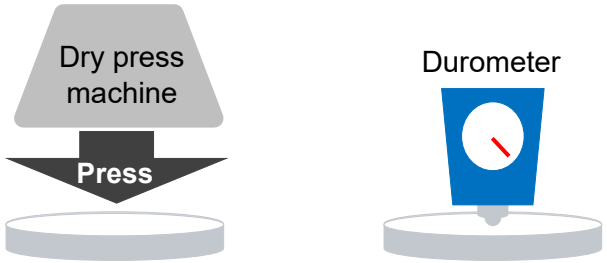
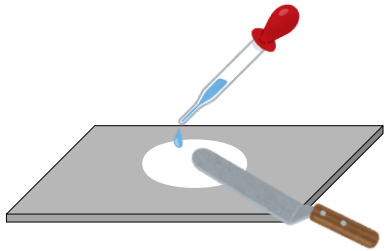
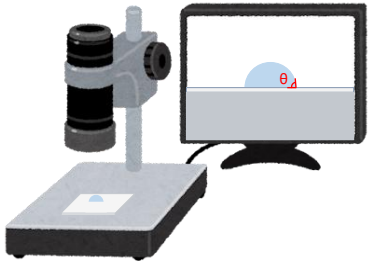
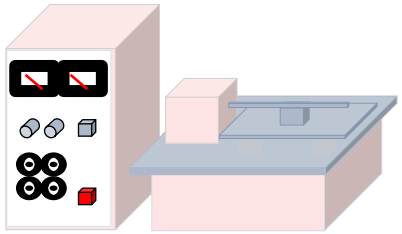
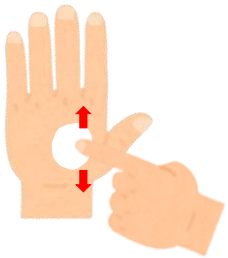
Methods

Pressability	Oil Absorption Capacity and Dispersibility
	
Visual confirmation of appearance. Measure hardness.	Oil absorption Capacity : Modified version of JIS K 5101-13-1,2 Dispersibility : Modification of the above

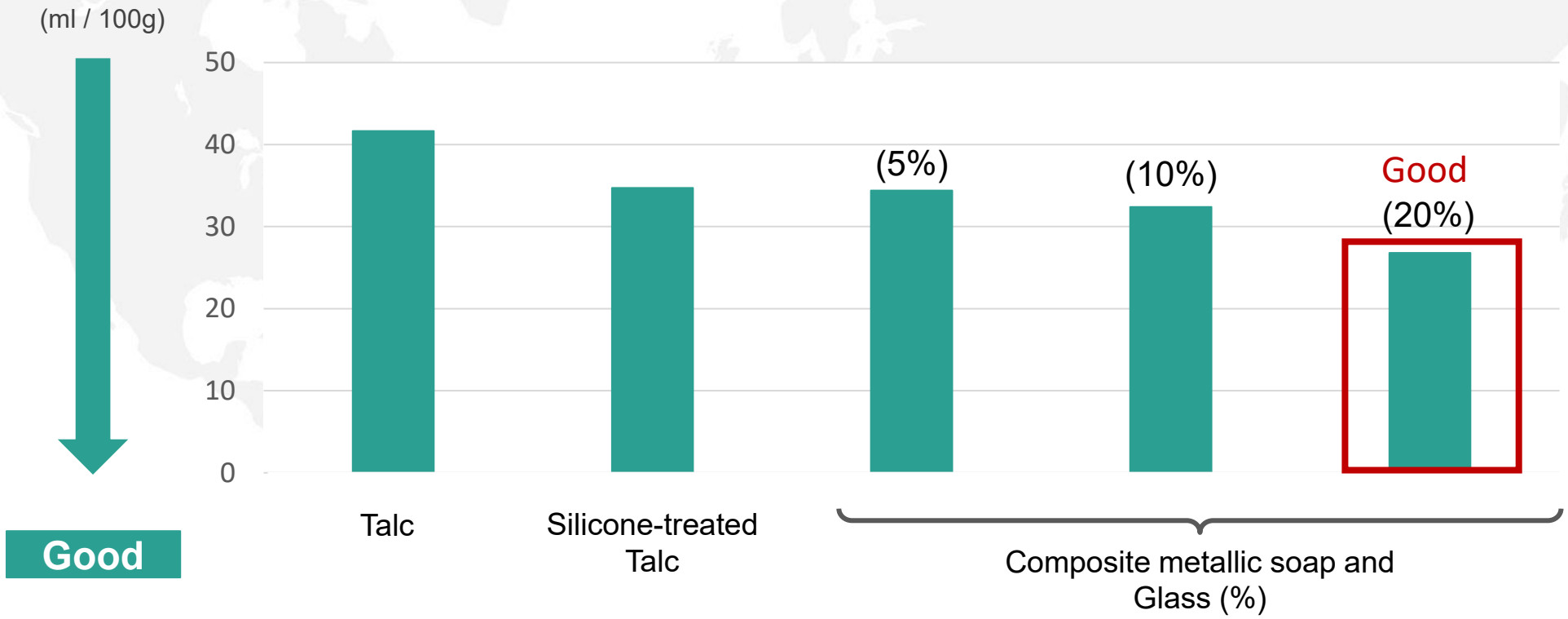
Water Repellency	Slipperiness and Smoothness	Sensory Evaluation of Texture
		
5.0 μL of water droplet was placed on the powder surface, and the contact angle θ was measured immediately and after 15 minutes using a microscope.	Slipperiness and smoothness were evaluated using a friction tester.	Each powder was visually inspected, and the texture was evaluated by fingertip application.

Selection of nucleating agent and its content in Calcium myristate

Composite metallic soap powders		Pressability	Oil Absorption capacity	Dispersibility	Water repellency	Slipperiness	Texture	Appearance (Coverage)	Formulation Compatibility evaluation
Metallic Soap	Nucleating agent								
Calcium myristate	Boron nitride	✓✓	59.2	✓✓	✓	✓✓	✓✓	Appropriate	Good
	Glass	✓✓	58.8	✓✓✓	✓✓	✓✓	✓✓	Appropriate	Good
	Barium sulfate	✓✓	58.9	✓✓✓	✓	✓✓	✓	High	Poor
	Barium sulfate and Magnesium myristate	✓✓	54.9	✓✓	✓✓	✓✓	✓	High	Poor
Silicone-treated Talc		✓✓	45.6	✓	✓✓	✓	✓✓	Appropriate	Good

Selection of nucleating agent and its content in Calcium myristate

It was found that a 20% core content yielded the best overall results and optimal dispersibility

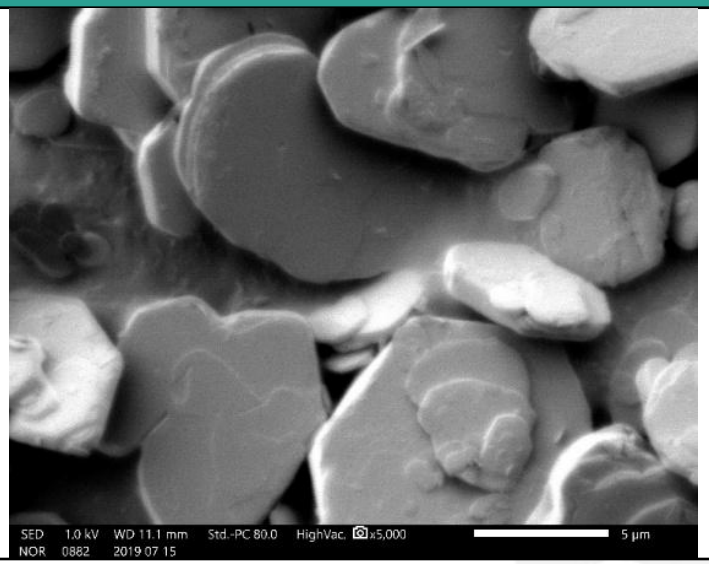


Method

A small amount of liquid paraffin is added stepwise to 100 g of powder, and its state is observed while kneading with a spatula. This is continued until the paste-form powder transforms into a solid mass, at which point the total consumed liquid paraffin content (g) corresponds to oil absorption.(n=3).
To the solid mass as described above, liquid paraffin was further added stepwise until the solid mass when scooped on a spatula was found to gently slip off.
The added amount of liquid paraffin corresponds to dispersibility.

Composite Metallic Soap

Novel composite of Calcium Myristate matrix (80 wt.%) and plate-like glass (20 wt.%). These rounded 14 µm plate-like particles, provide a unique combination of softness, high slipperiness, and excellent adhesion, surpassing conventional surface treatments.

Visual image and characteristics	SEM image of the composite metallic soap powder
	

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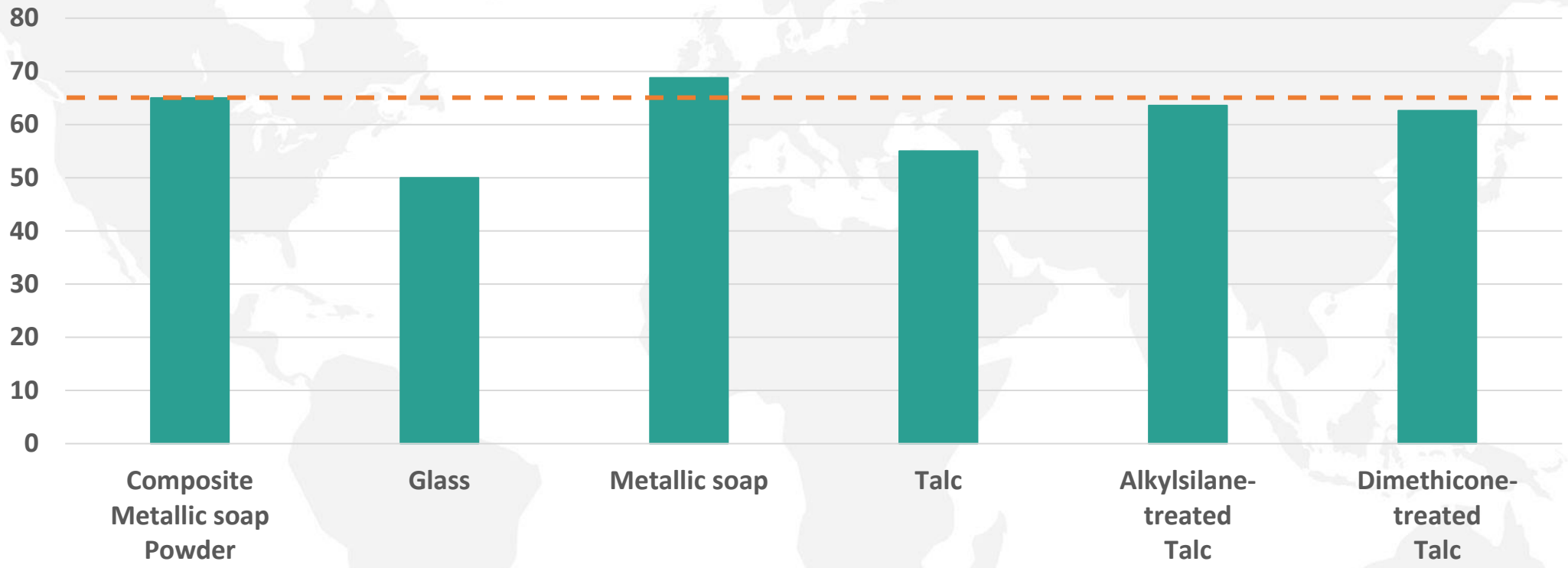
Press hardness

Composite Metallic Soap Powder has a hardness equivalent to that of talc.



Method

The appearance of each powder (10.0 g) was observed after being pressed using a dry press machine.
In addition, the hardness was measured using a durometer (TECLOCK GS-701N TYPE C).

Pick up and pressability

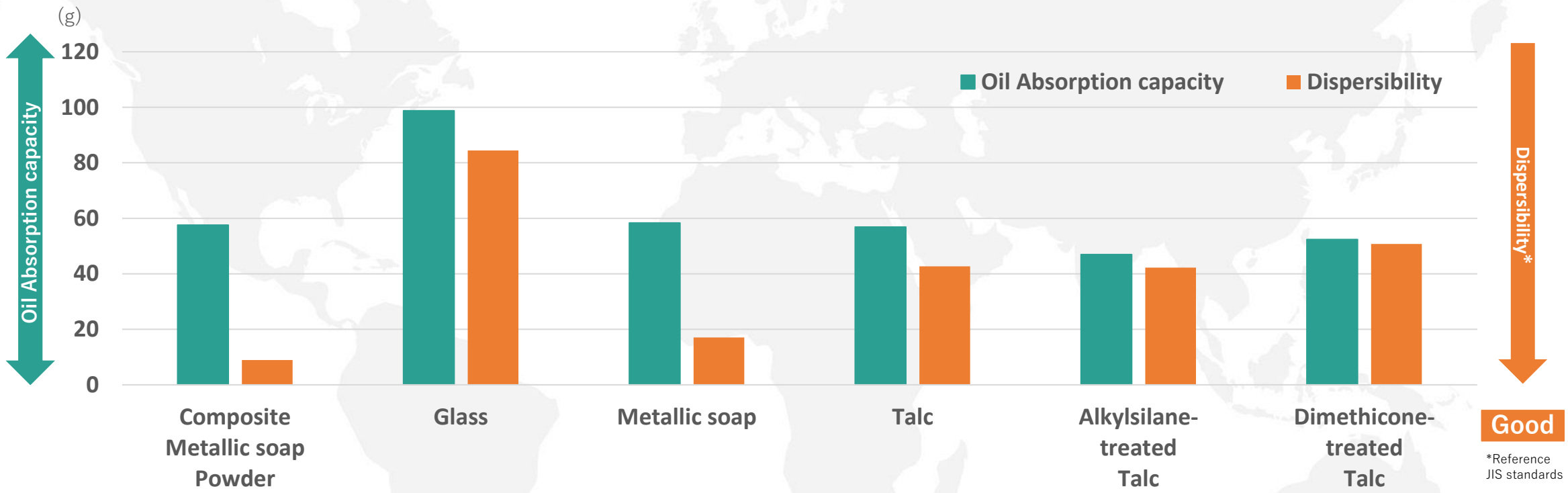
Composite Metallic Soap Powder offers excellent pick up and high pressability.

Powder	Composite Metallic soap Powder	Glass	Metallic soap	Talc
A surface rubbed with a puff				
Pick up	✓	× Crumbling	× Caking	✓
Pressability (Drop test)	✓	× Easy to crash	✓	✓

Method The evaluation powder was formulated into a powder foundation to conduct Payoff and drop tests. Pick-up was evaluated by rubbing the surface multiple times with a puff, while the drop test results were based on dropping the product from a height of 50 cm(The test is passed if it withstands 3 or more drops).

Oil absorption and dispersibility

[Oil Absorption capacity] Composite Metallic Soap Powder has an oil absorption equivalent to that of talc.
[Dispersibility] Composite Metallic Soap Powder exhibits superior dispersibility compared to the reference powder.

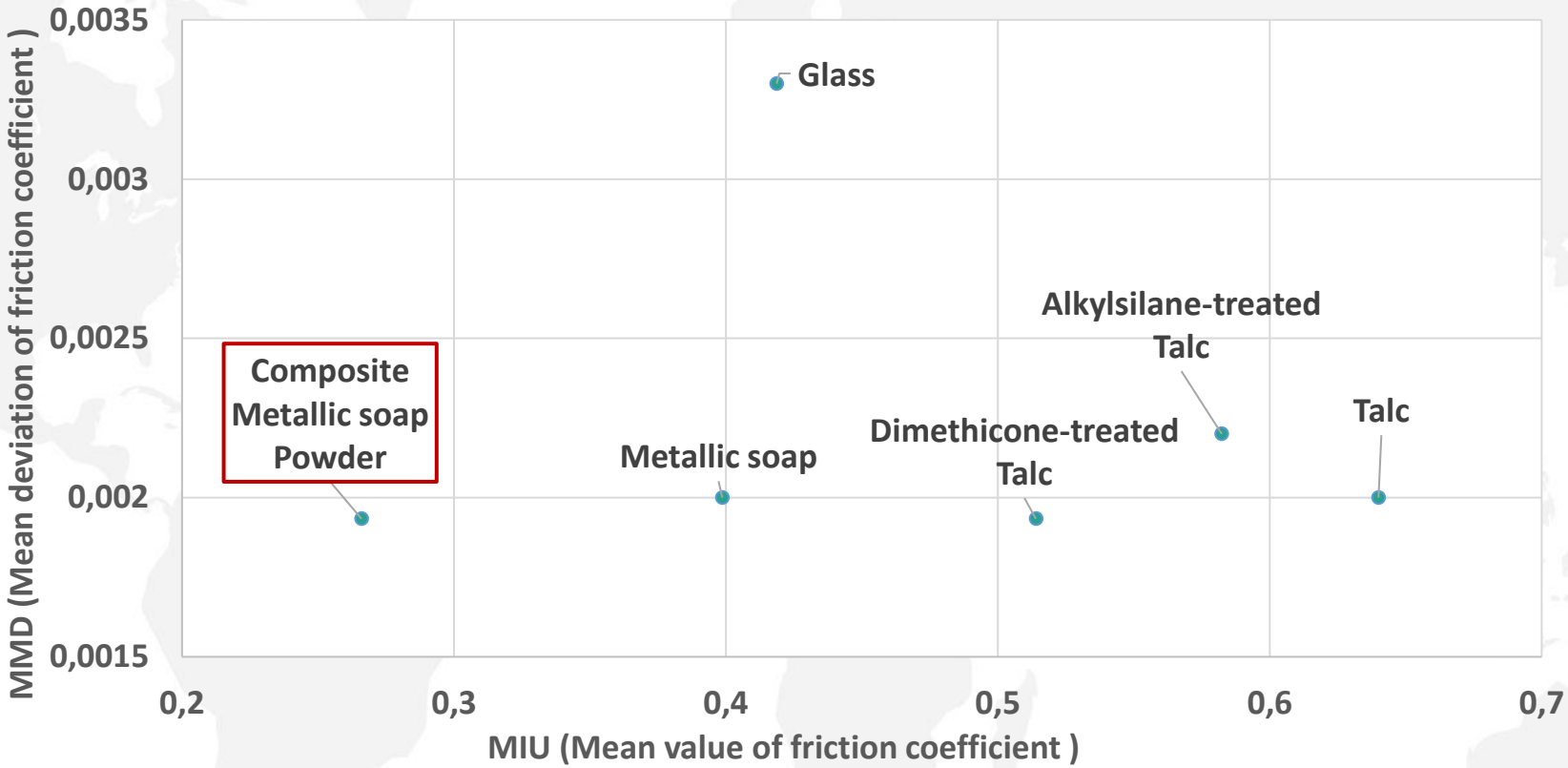


Method

A small amount of liquid paraffin is added stepwise to 100 g of powder, and its state is observed while kneading with a spatula. This is continued until the paste-form powder transforms into a solid mass, at which point the total consumed liquid paraffin content (g) corresponds to oil absorption.(n=3).
To the solid mass as described above, liquid paraffin was further added stepwise until the solid mass when scooped on a spatula was found to gently slip off.
The added amount of liquid paraffin corresponds to dispersibility.

Slipperiness and smoothness

Composite Metallic Soap Powder provides superior slipperiness and smoothness compared to the reference powder.

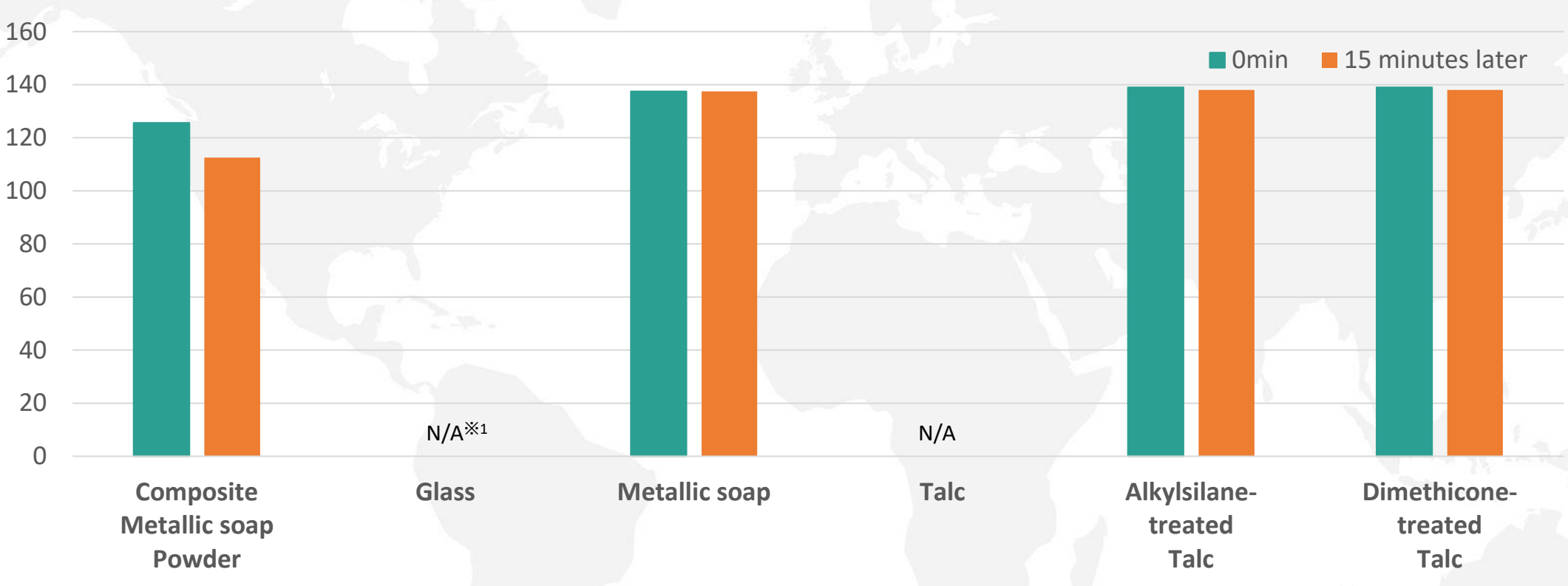


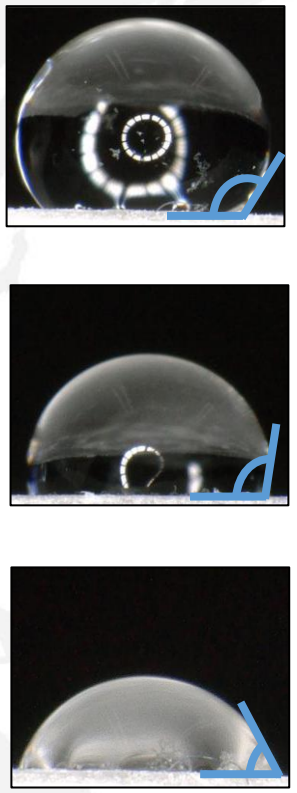
Method

50 mg of the powder was uniformly applied to a 10cm² area of black artificial leather. Slipperiness and smoothness were evaluated (n=3) using a friction tester (KES-SE, Kato Tech Co., Ltd.) with the artificial leather as the sensor.

Water repellency

Composite Metallic Soap Powder possesses high water repellency, comparable to silicone-treated talc.





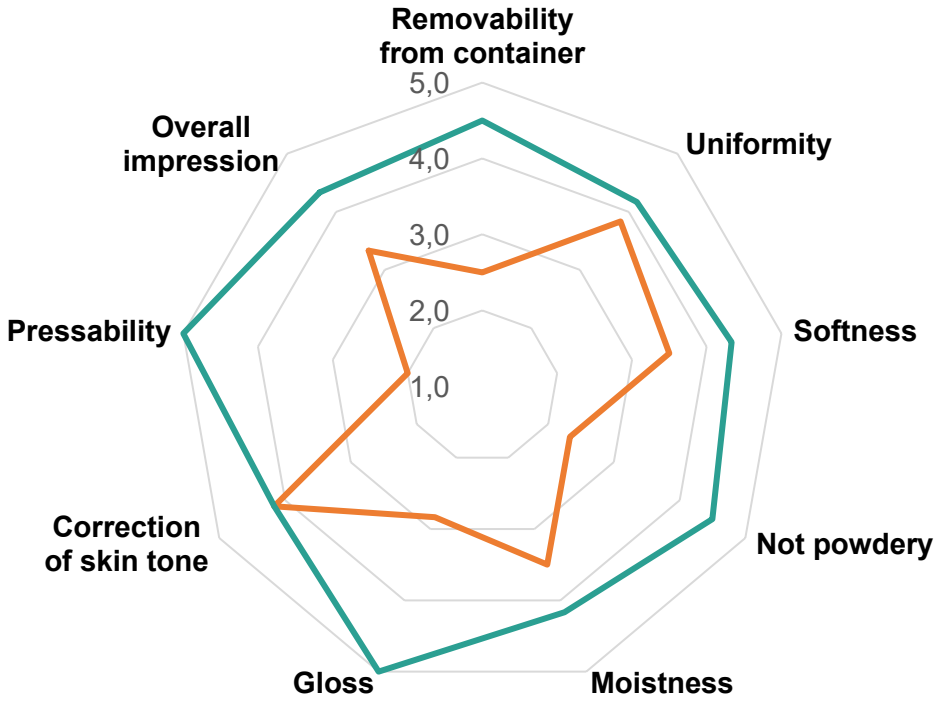
※1 N/A : impossible to measure

Method

A 5.0 μL droplet of water was placed onto the powder. The contact angles were measured immediately after and 15 minutes after application using a microscope (n=6).

Sensory evaluation

Pressed foundations formulated with Composite Metallic Soap Powder perform as well as or better than those with talc across nearly all sensory evaluation criteria.



Conventional talc

Composite metallic soap powder (Calcium myristate, Glass)

- **Test Powder (Evaluation Powder)**: 20.0%
- **Sericite**: 56.5%
- **Silica**: 10.0%
- **Titanium Dioxide**: 5.0%
- **Pigments**: 0.50%
- **Oil Phase (Lipid / Emollient)**: 8.0%

Method

A sensory evaluation was conducted to compare the texture and application of pressed foundations formulated with talc versus those with Composite Metallic soap Powder.

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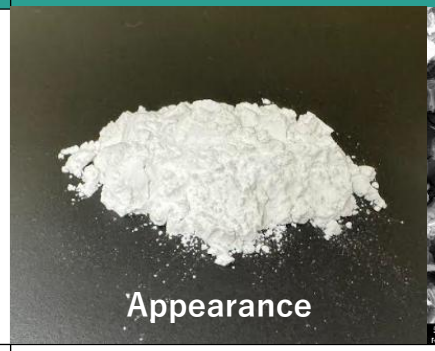
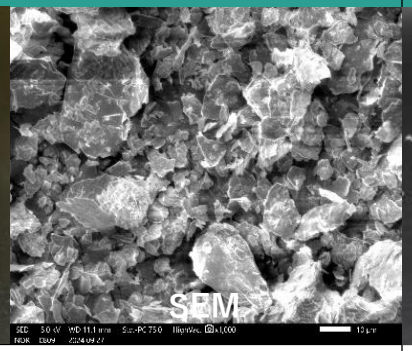
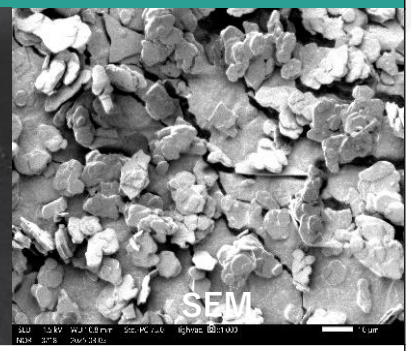
Conclusion

This study presents a novel Composite Metallic Soap powder developed via a double decomposition method with an inorganic nucleating agent. The resulting material exhibits excellent pressability, water repellency, dispersibility, and slipperiness matching or exceeding the performance of talc.

	Conventionally used Talc	Composite metallic soap produced by the novel manufacturing method
Image	 	 
INCI name	Talc	Calcium Myristate, Glass
Shape (size)	Plate-like (5 - 11μm)	Plate-like (14μm)
Pressability	✓✓✓	✓✓✓
Sensory feel	✓✓	✓✓✓
Dispersibility	✓✓	✓✓✓
Water repellency	–	✓✓✓
Natural Origin Index	ISO16128 = 1	ISO16128 = 1

Thank you for your kind attention