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Technology for diversity:

A new concept of aqueous mist spray technology to enhance the protection effect of your favorite cosmetics

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Introduction:

Cosmetics diversification



A way of self-expression used by men and women of all ages.[1] Variety of quality expressions, excellent lasting effects,

Global pandemic



Wearing masks as a norm increases skin problems.^[2]

However...

- Cosmetics with a longlasting effect
- Limited range of formulation and feel
- Overcoat the cosmetic film with spray mist
- Necessary to use an oilsoluble film and volatile oil
- Not good for the skin or environment

Aim of study

- Development of a novel material that has high water repellency and water retention can dissolve in aqueous systems and provide.
- Proposal for a safe and easy-to-use aqueous spray mist technology that can greatly improve the lasting effect of any cosmetic product with minimal effects on the environment.

Features of the new spray mist technology

and skin friendliness are required.

Human- and Eco- Friendly

Aqueous single-phase formulation without volatile oil or oilsoluble film; easy and safe to use for both adults and children.

Long-lasting for various types of cosmetics

Protects cosmetics from water and external stimuli caused by masks.

Moisture retention

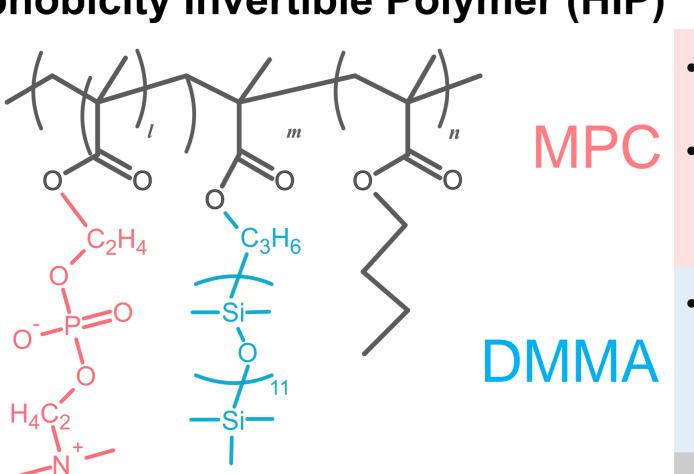
Retains moisture in the skin and prevents skin problems caused by dryness.

Materials & Methods:

Key Material "HIP" to solve the problems

Hydrophobicity Invertible Polymer (HIP)

MPC/DMMA/BMA Copolymer

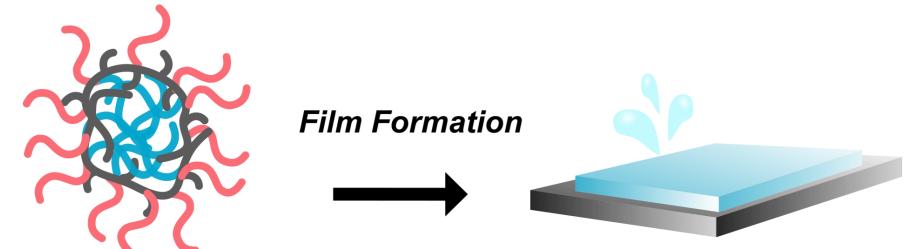


3 constituent monomers

- Phospholipid-like structure with a zwitterion and exhibits high hydrophilicity and skin affinity.[3] Specific way of interacting with water and provides functions such as inhibiting protein adhesion to cells^[4] and repelling water.^[5]
- Linear silicone chain and effective in providing high water repellency and smoothness. As a result, it is an important material for improving cosmetic durability and feel. [6]
- Balancing hydrophilic and hydrophobic properties to improve molecular foldability.

Achieves dispersion in water and water repellency in the film state

BMA



Examined the ratios of the three monomers and discovered a specific composition ratio that enabled both transparent dispersion in water and high water repellency in the film state.

lear d	ar dispersion in water				Water repellent film							
	MPC-DMMA-BMA	MDB1	MDB2	MDB3	MDB4	MDB5	MDB6	MDB7	MDB8	MDB9	MDB10	MDB11
	MPC	90	80	70	50	40	30	20	10	30	30	30
	DMMA	5	10	10	10	10	10	10	10	20	30	40
	BMA	5	10	20	40	50	60	70	80	50	40	30
	Water dispersibility*1	0	0	0	0	0	0	×	×	0	0	×
	Water repellency*2	×	×	×	×	Δ	0	-	-	0	0	-

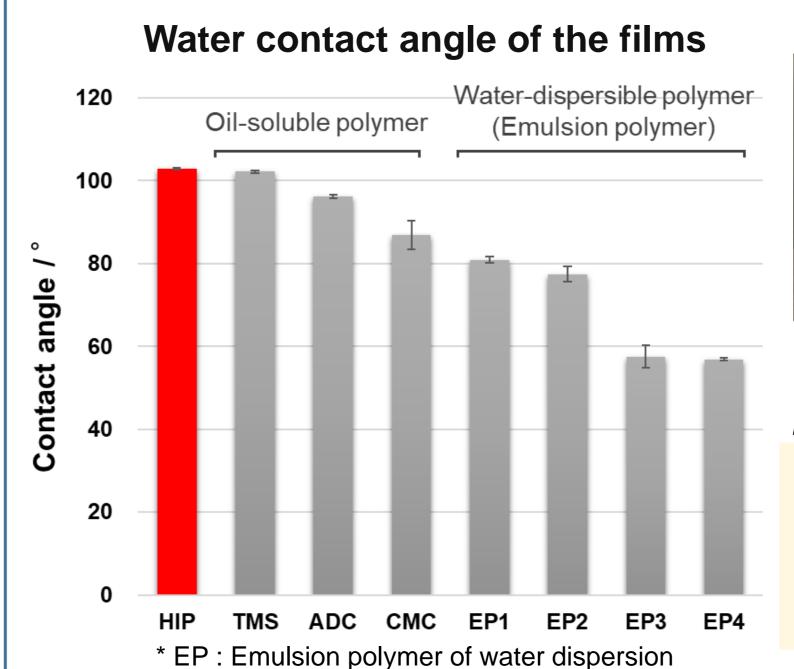
*2: When the water contact angle is θ , the value is Δ when $\theta > 60^{\circ}$, Θ when $\theta > 80^{\circ}$, and Θ when $\theta > 100^{\circ}$

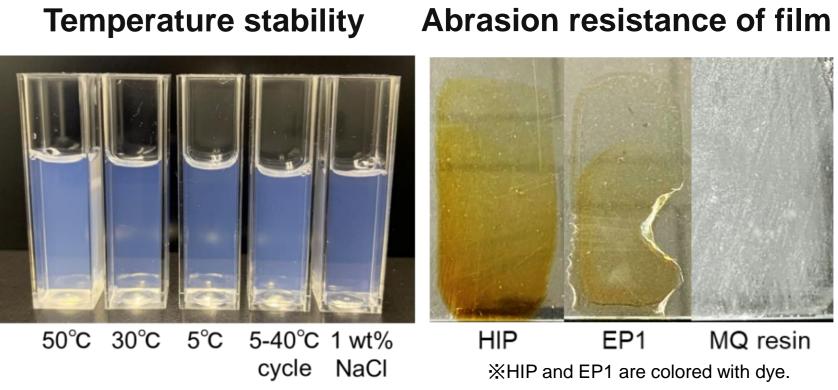
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Results & Discussion:

1. Water Repellency of the Film and Water Dispersibility of HIP





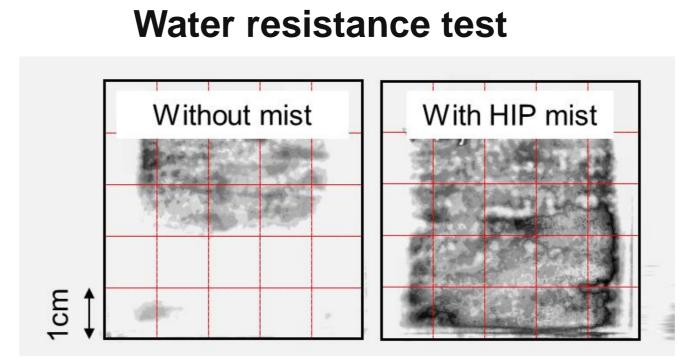
HIP shows

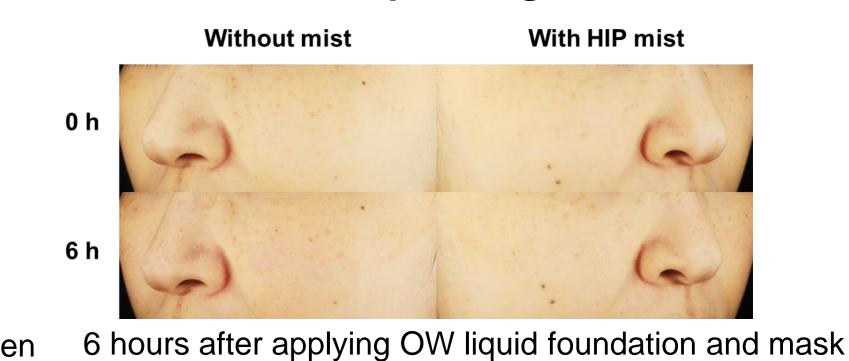
High water repellency comparable to that of oil-soluble film formers

Makeup lasting test

- Transparent and stable dispersion in water
- High abrasion resistance

2. Cosmetic Lasting Effect from Water and External Stimulation





UV image of PMMA plate coated with OW sunscreen

Before wash After wash Without mist With HIP mist SPF residual after 1-minute water bath

Skin color change before and after the test and

adhesion of foundation to the mask

Spray Mist with HIP

- Greatly improves the water resistance of sunscreens
- Suppresses color change under high temperature and high humidity conditions
- Prevents make-up from adhering to the mask

3. Anti-Drying Effect on Skin Moisture content inside **Transepidermal water loss** the stratum corneum EWL/g → HIP → Water → EP Time / h

Spray Mist with HIP Prevents moisture evaporation from the skin surface and

keeps moisture inside the skin. Protects the skin from dryness and prevents skin problems.

Conclusions:

- > Our novel material (HIP) showed the contradictory properties of transparent stable dispersion in water and high water repellency in the film state.
- > The spray mist with HIP is an aqueous single phase that is gentle on the skin and kind to the environment.

Measured by in vivo confocal Raman spectrometer

> The spray mist with HIP forms a durable film and protects the cosmetic film from external irritants caused by water and masks.

Our technology can contribute to the functional improvement of body care products for both adults and children and help expand the range of diversified self-expressions possible through cosmetics.

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