

Characteristics of natural derived surface treated pigments for the achievement of SDGs

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Introduction

Due to the high functional properties, such as water-resistance, high dispersibility and good tactile feelings, surface treated pigments have been formulated into a lot of make-up cosmetics. However, each type of surface treated pigments shows completely different characteristics depending on the chemical structures of each surface treatment agents. In this work, to reveal the characteristics of each type of surface treated pigments, especially focused on natural surface treatments, we evaluated their mechanical properties and tactile feeling.

Advantages of Surface treatment

Water-resistance

good wettability

High dispersibility

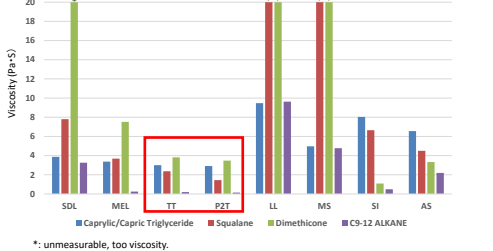
Surface treated pigments

Non-treated pigments
Powder characteristics are greatly affected by surface condition of powders

Wettability and dispersibility

Wettability and Dispersibility TEST of surface treated TiO₂

Method: After making Oil paste (60 g of Powder/40 g of Oil), measured viscosity.



Dispersibility of each kind of surface treated red iron oxide in W/O emulsion.

Red iron oxide 5g
9-12 alkane 20g
Water 20g
Surfactant 1g

Shake well by hand

P2T shows similar dispersibility to TT for all kinds of cosmetic oils

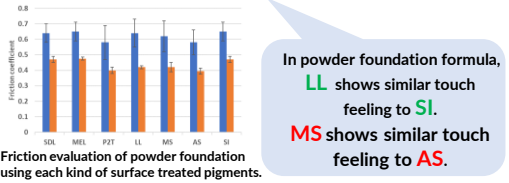
Lipstick formula **without using three roll mill**.
Methods: Each surface-treated iron oxide added directly into oil phase at 80°C, and mixed by disper mixer at 1,000rpm for 1 min.

AS SI TT LL P2T

Visible lines No lines

Excellent dispersibility

Tactile feeling and friction property of powder foundation



Materials & Methods:

TT: Isopropyl titanium triisostearate

AS: Triethoxy caprylylsilane

SI: Methylhydrogen polysiloxane

SDL: Sodium dilauryldiglutamate lysine, magnesium chloride

MEL: Mannosyl erythritol lipid

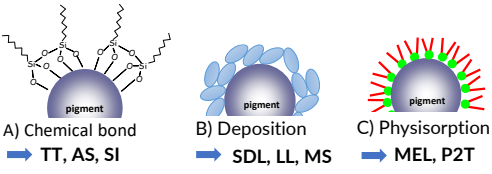
LL: Lauryl lysine

MS: Magnesium stearate

P2T: Polyglyceryl-2 tetraisostearate

Petrochemicals **Natural derived**

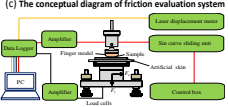
surface treatment pattern



Sensory and friction evaluation of powder foundation

(a) The photograph of friction evaluation system

(b) Human finger model



Sensory evaluations of powder foundation were performed by 4 formulator of 25 to 35 years old After they touched powders, the subjects scored 1-10 point to each 11 tactile sensations regarding the tactile dimensions as follows: warm, cold, soft, hard, moist, dry, smooth, sticky, rough, slippery, and creak feels

Results & Discussion:

Physical properties of surface treated TiO₂

	Content angle (°)	Content angle, 1.8 (BOC°)	Particle size (nm)	Area of repeat (°)	Bulk specific gravity (g/mL)	Specific surface area (m ² /g)	Oil absorption (9-12alkane)(mL/100g) /MAX temp (Oto)
SDL	120	38	0.886	38.0	1.08	8.4	24.1/48.1
MEL	122	35	0.341	38.0	1.00	8.2	23.0/11.5
TT	158	65	0.838	38.0	1.18	8.2	18.3/8.3
P2T	158	60	0.188	38.0	1.00	8.0	14.8/8.1
LL	145	48	0.894	33.0	0.95	8.9	31.0/33.3
MS	143	50	0.818	38.0	1.03	7.7	24.8/23.5
AS	158	144	0.298	38.5	1.43	8.4	15.7/7.8
SI	152	140	1.593	49.5	1.06	8.3	25.4/51.0
NT	-	-	0.313	45.0	0.88	10.7	40.2/37.8

Conclusions:

- 1) TT and P2T whose chemical structures are including long-chain branched fatty acid esters show high dispersibility and wettability in all kinds of cosmetic oils. This result indicates that TT and P2T treated pigments would be suitable for oil-based cosmetics, such as W/O liquid foundations, concealers and lipsticks.
- 2) From the viewpoint of tactile feeling of powder foundation, MS and LL treatment could be natural alternative of AS and SI treatment, respectively.
- 3) Due to the high utility of SDL and MEL treatment, multiple types of cosmetics, such as pressed powder foundation, W/O, O/W liquid foundation, lipsticks, and so on, could be prepared with these treatments.
- 4) These results reveal that characteristics of each type of surface treated pigments will be greatly affected by chemical structure of each surface treatment agents.