Sep. 20, 2023
Lion Corporation

Reduces Clothing Cling by Approximately 20%!
Lion Develops New Technology for Imparting a Smooth Feel to Clothing

Lion Corporation (President: Masayuki Takemori) has, through its research into improving clothing comfort by enhancing fabric textures, created a technology to impart a smooth, non-cling finish to laundry. When it comes to clothing's texture, in addition to conventional demand for softness, recent years have seen growing demand for smooth fabrics that glide across the skin, a texture the new technology makes possible. Washing*1 clothing with fabric softener that incorporates the new technology can reduce clothing Cling*2 by approximately 20% compared with conventional products. This study has been presented at the 2023 annual conference of the Society of Fiber Science and Technology, Japan; the 2023 annual conference of the Japan Research Association for Textile End-Uses; and the 2023 Annual Meeting of the Japan Oil Chemists' Society (details below).

*1 When washed using fabric softener alone, without detergent
*2 Based on evaluations of clothing surface clinginess

■ Background

Until recently, the basic function of fabric softeners has been to impart softness. However, in recent years, the diversification of consumer needs has led to demand for products that incorporate additional fabric deodorizing and damage control functions as well as functions that impart a smooth and dry texture that allows clothing to glide comfortably across the skin, even when sweating or amid hot, humid conditions (Figure 1). Aiming to impart this kind of smooth and dry texture to clothing, Lion's researchers examined a variety of texture-related additives and found that a proprietary silicone material developed by Lion ("Silicone A") offered an outstanding smoothing effect. In this study, we analyzed the physical properties of clothing in order to elucidate the factors behind the smoothing effect of Silicone A.

Figure 1. Consumers' Ideal Textile Textures (June 2021 Lion survey; 842 respondents)

■ Study Results

Cotton underclothes (“clothing”) were washed using a fabric softener formulated with Silicone A or a fabric softener formulated with a cationic surfactant, a typical softening ingredient used in fabric softeners. After the clothes were dried, the following items were assessed.

Texture:

Sensory assessment of smoothness by touching the dried clothing with the palm of the hand (Scheffé-paired comparison models).

Surface Viscosity Property:

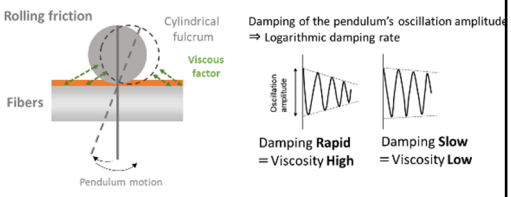
To assess the physical properties of the clothing surface, a rigid-body pendulum test was used to measure the viscosity of the clothing surface (“surface viscosity”*3) when dry and when wet.

Water absorbency:

A device was used to measure the water absorbency of the clothing.

*3 In the study results, clothing surface viscosity is indicated as adherence

Evaluation of Surface Viscoelastic Property Using a Rigid-Body Pendulum



When the sample surface (clothing surface) that the rigid pendulum touches has high viscosity, the resulting resistance causes a rapid damping (reduction) of its amplitude of oscillation. Conversely, when the sample surface has low viscosity, damping is slower. In this experiment, surface viscosity was assessed based on the logarithmic damping rate of the amplitude of the pendulum oscillation.

■ Study Results

(1) Evaluations of Dry Clothing Texture

Clothing was washed with the Silicone A fabric softener, the cationic surfactant fabric softener, and no fabric softener, then dried. The assessment of the texture of the dry clothing found that the clothing washed with the Silicone A fabric softener had the smoothest texture (Figure 2).

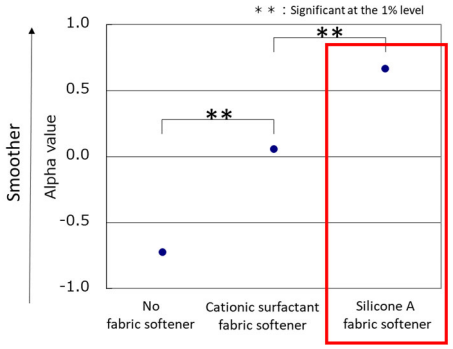


Figure 2.Clothing Texture Assessment Results

(2) Evaluations of Texture of Dry Clothing Surface Viscosity

Assuming that achieving a smooth texture is related to the physical properties of the clothing surface, we sought to assess said physical properties, focusing specifically on clothing surface viscosity as an indicator of the adherence between clothing and skin.

Measurement of the surface viscosity of each clothing sample after washing and drying found that the clothing washed with the Silicone A fabric softener had a surface viscosity (as indicated by the logarithmic damping rate) that was approximately 20% lower than that of the clothing washed with the cationic surfactant fabric softener (Figure 3).

From this result we inferred that, when worn, the lower surface viscosity of the clothing washed with the Silicone A fabric softener would result in lower resistance against the skin (that is, a lower adherence to the skin), thus achieving a smooth, non-cling feel.

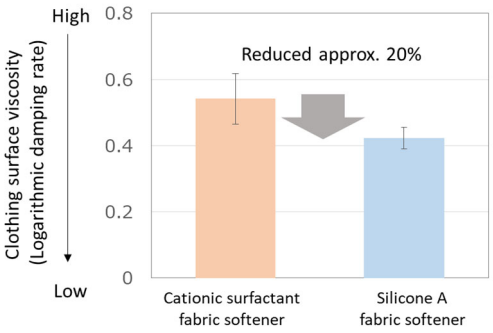


Figure3. Clothing Surface Viscosity Assessment Results (Dry)

(3) Evaluations of Wet Clothing

To understand how clothing would feel when wet, such as after sweating, we evaluated the clothing samples' surface viscosity when wet as well as their water absorbency. As a result, we found that the clothing washed with the Silicone A fabric softener exhibited lower surface viscosity not only when dry, but also when wet (Figure 4). Also, the evaluation of the water absorbency found that clothing washed with the Silicone A fabric softener absorbed more water faster (Figure 5). In other words, these findings indicate that, in addition to reducing the adherence of wet clothing to the skin, the use of Silicone A also results in higher water absorbency, helping reduce the retention of water at the surface of clothing, against the skin, and as such is expected to impart a smooth feeling to clothing.*4

*4 In comparison to wet clothing washed with a cationic surfactant fabric softener

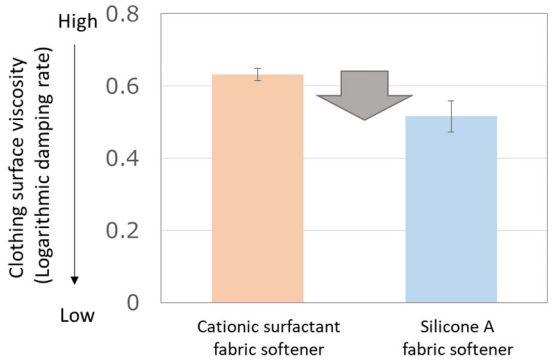


Figure4. Clothing Surface Viscosity Assessment Results (Wet)

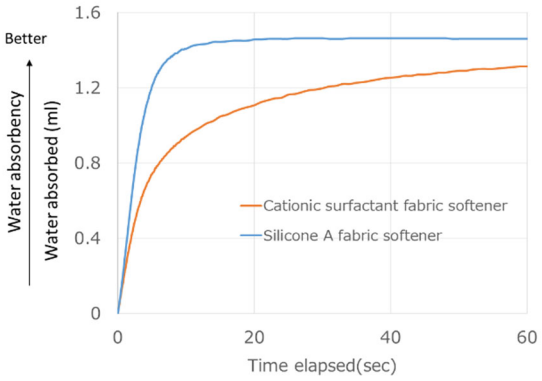


Figure5. Change in water absorbed by clothing over time

The results of this study were presented at the events shown below.

【The 2023 annual conference of the Society of Fiber Science and Technology, Japan, June 14 (Wednesday) and 16 (Friday), 2023】
○Title : "Study on domestic laundry softener imparts smooth and dry feeling"
○Presenter: Research and Development Headquarters, Lion Corporation
Haruka Ebisawa, Ryo Hashimoto, Daisuke Sasaki, Hikaru Takabayashi, Shinya Sudo, Miyuki Miyake, Tomohiko Amatani, Eiji Ogura, Research and Development Headquarters, Lion Corporation.

【The 2023 annual conference of the Japan Research Association for Textile End-Uses, June 24 (Saturday) and 25 (Sunday), 2023】
○Title : "Research on household fabric softeners that last to smooth feel to clothing"
○Presenter: Research and Development Headquarters, Lion Corporation
Ayato Ueda, Haruka Ebisawa, Ryo Hashimoto,Daisuke Sasaki, Hikaru Takabayashi, Shinya Sudo, Miyuki Miyake, Tomohiko Amatani, Eiji Ogura, Research and Development Headquarters, Lion Corporation.

【the 2023 Annual Meeting of the Japan Oil Chemists' Society, September 7 (Thursday) and 9 (Saturday), 2023】
○Title : "Texture and Water Absorption Behavior of Clothing treated with Silicone Fabric Softener"
○Presenter: Research and Development Headquarters, Lion Corporation
Hikaru Takabayashi, Shinya Sudo, Miyuki Miyake, Haruka Ebisawa, Ryota Hashimoto, Ryo Hashimoto, Daisuke Sasaki, Atsunori Morigaki, Yasushi Kakizawa, Research and Development Headquarters, Lion Corporation.

Using surface control technology like the new technology for imparting texture to clothing established by this study, Lion will continue to advance product development aligned with consumer needs.

■ Related information
・R&D Case Study on the Research and Development section of Lion's Corporate Website
https://www.lion.co.jp/en/rd/development/home/case03.php

About *SOFLAN Airis*

The technology established through this study has been applied to *SOFLAN Airis* laundry water, launched in April 2023 as a new style of fabric softener with a pure, clear water-like texture. *SOFLAN Airis* provides an airy experience that permeates not only the completed laundry, but also the air and the feeling of doing laundry itself by offering three new sensory experiences in the realms of smell (fragrance), touch (comfort) and sight (design).
https://soflan.lion.co.jp/airis/