

## Shiseido Independently Develops Two Types of Devices that Realize Highly Accurate Tactile Evaluation

~ Research on cosmetics that resonate with the mind and skin ~

Shiseido Company, Limited (“Shiseido”) has developed two types of tactile evaluation device, Vibration Friction Sensor and Contact Force Sensor\*<sup>1</sup>, through joint research with Tokyo Metropolitan University. Previously, it was thought to be difficult for a third party to understand the tactile sensation that a consumer may experience.

Now, with the new sensors that can quantify tactile sensation with higher accuracy, and focusing on the hand movements when a consumer checks their skin condition, we are able to objectively and numerically grasp the tactile sensation that the consumer is feeling with their hands. The Vibration Friction Sensor measures vibration and friction using a contactor\*<sup>2</sup> which strokes the skin to evaluate the consumer’s perception of “moistness” and “smoothness” of the skin, while the Contact Force Sensor measures contact force when the contactor presses the skin to evaluate “softness” and the consumer’s perception of “elasticity” of the skin. We have also confirmed that the measured values of these two sensors correlate with the sensory evaluation scores of expert evaluators.

Going forward, we will clarify the sensitivity characteristics of people attributed to differences in culture and custom around the world, and will optimize the use of the two tactile sensors based on our knowledge of hand movements accumulate from our consumers. Moreover, by applying them to product development and services, we will be able to deliver more satisfying and comfortable-to-use cosmetics for people worldwide.

Shiseido will continue to deepen its research in sensory and psychology fields, not only to improve the effects and efficacy of its products, but to develop new values that satisfy and resonate with the mind and skin of consumers.

\*<sup>1</sup> Contact force: Force generated when an object comes into contact with another object.

\*<sup>2</sup> Contactor: A component of a sensor that is in contact with or inserted into the measurement object. It may also be called a probe.

### Research background

When a consumer applies cosmetics, they see, touch and feel the conditions of their bare skin and their skin after application. However, it is very difficult for a third party to accurately interpret the tactile sensation the consumer experiences when touching their skin with their hands, which we see as a challenge in the development of products that truly satisfy consumers around the world. Therefore, we are pursuing the development of technology in order to understand consumers’ actual tactile sensation with high accuracy. In this research, we have verified the motions of Japanese and American consumers in confirming the tactile sensation on the skin, and found that people confirm tactile sensation through different motions such as sliding or pressing their fingers on the skin for each type of sensation. We also found that there are differences



Figure 1. Checking the tactile sensation of the skin

between Japanese and American consumers in motions to confirm tactile sensation\*<sup>3</sup>. Thus, we decided to develop two types of sensors specifically for evaluating skin tactile sensation that can accurately measure to a high degree the physical properties felt by the hands in each motion.

\*<sup>3</sup> Naomi Arakawa, et al., International Journal of Cosmetic Science, 2021; 43, 78-87, Results of joint research with Keio University

### Development of Vibration Friction Sensor

We have independently developed Vibration Friction Sensor that enables us to accurately grasp and quantify the consumer's perception of "moistness" and "smoothness" of the skin when a consumer slides their fingers over the skin. Conventional tactile sensors require experimenters to have the contactor stroke the skin to make measurements, but it is difficult to make stable evaluations due to variations in motion during measurement. However, the newly developed sensor can stroke the skin as its motor rotates, and realize stable measurement even on a small area such as the cheeks (Figure 2). By having the contactor surface mimic a fingerprint, it becomes possible to simultaneously measure the vibration and friction felt when sliding the fingers over the skin. In this study, we applied lotions with varying feel to the skin and compared the sensory evaluation scores of expert evaluators with the measured values of the Vibration Friction Sensor. As a result, the sensory evaluation score for "moistness" correlated with vibration value (Figure 3).

Part of the results of this research was presented at the 31st IFSCC Congress 2020 Yokohama held from October 21 to 30, 2020.



Figure 2. Uniquely developed Vibration Friction Sensor

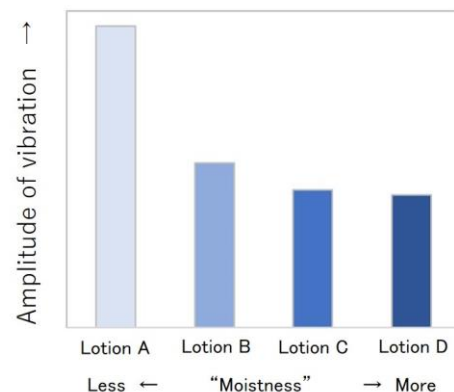


Figure 3. Sensory evaluation score for "moistness" correlates with vibration value

### Development of Contact Force Sensor

We have independently developed Contact Force Sensor that enables us to accurately grasp and quantify "softness" and the consumer's perception of "elasticity" of the skin when a consumer presses their fingers onto the skin. With conventional measuring techniques, it is difficult to accurately measure the differences in skin softness between individuals, and there have been insufficient findings regarding characteristic values\*<sup>4</sup> that correlate with tactile sensation when pressing the skin. Meanwhile, the Contact Force Sensor we have developed uses an installed high-precision force sensor to measure the contact force when pressing the contactor onto the skin, which mimics the action of a hand pressing the skin (Figure 4). In addition, by analyzing the waveforms measured while the contactor is pressed onto the skin, it becomes possible to calculate the values of characteristics that indicate individual differences in the skin. We studied these characteristic values and found that the rate of recovery after the contactor presses the

skin (compression resilience) correlates with the sensory score for elasticity. Compression resilience was also found to correlate with age, indicating that changes in skin softness with age can be estimated (Figure 5).

Part of the results of this research was presented at the 15th Spring Annual Meeting of Japan Society of Kansei Engineering (held on March 5 and 6, 2020), where it received the Outstanding Presentation Award, and also at the 86th SCCJ (Society of Cosmetic Chemists of Japan) Research Symposium (held on July 15, 2021).

\*4 A numerical value that quantitatively expresses the characteristics and properties of the data or object to be analyzed.

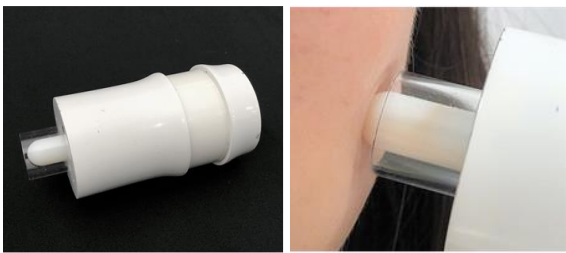


Figure 4. Contact Force Sensor (left) and measuring process(right)

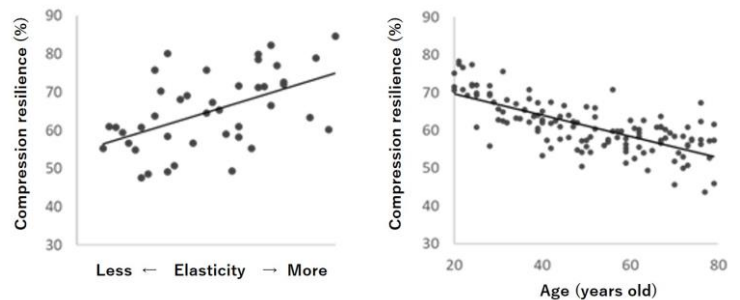


Figure 5. Relationship between compression resilience and “elasticity” and “age”

#### Future action

This time, we have developed two types of tactile sensors that enable a third party to understand the skin tactile sensation felt by a consumer with high accuracy. By using these sensors, we can accurately evaluate to a high degree the differences in skin texture felt by consumers. Furthermore, by expanding the scope of our survey on cosmetics behaviors of people around the world, we will be able to offer products that truly satisfy people across diverse countries and regions. We will use the new tactile sensors in the development and evaluation of our products and services, and by further deepening our research in sensory and psychology fields, we will not only improve the effects and efficacy of our products, but develop new values that will satisfy and resonate with the mind and skin of consumers.