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Kao's Space Laundry Sheet and 3D Space Shampoo Sheet Selected for Use at the International Space Station (ISS)

The Household Products Research, Hair Care Products Research and Packaging Technology Research units of Kao Corporation submitted proposals to a solicitation for new ideas from the Japan Aerospace Exploration Agency (JAXA) to help meet challenges faced in both living in space as well as on Earth. Two of Kao's proposed products, the *Space Laundry Sheet* for removing dirt, stains and odors from clothing and the *3D Space Shampoo Sheet* for easily wiping away dirt and sebum from the scalp and hair, were selected for adoption. They will be used onboard the International Space Station (ISS) from around 2022.



Space Laundry Sheet



3D Space Shampoo Sheet

In addition, the expertise gained in development of these products is anticipated to have applications not only for life in space but also for here on Earth during times of disaster, hospital stays, and in countries and regions experiencing water shortages. Kao will continue to conduct research on ways to achieve sustainable washing and cleanliness without using water.

■ Background

Kao conducts a wide variety of research activities for the wholehearted satisfaction and enrichment of the lives of people globally. Kao has advanced Essential Research to fully reveal the mechanisms of dirt and stains with particular focus on maintaining the cleanliness of clothing, hair and the body, and has developed various technologies related to washing.

For the closed environment of the ISS where resources such as water and daily necessities are limited, Kao deployed its technologies for providing cleanliness built up over many years to contribute to improving the quality of life of astronauts, and submitted proposals on daily necessities to JAXA.

■ ISS challenges

Because water is such a precious resource in outer space, daily life during long stays on the ISS is very different than on Earth. For one, clothing cannot be washed, so even if sweaty odors become noticeable, astronauts have to keep wearing the same clothes day in and day out. And if clothing becomes stained or dirty, it cannot be washed, so the only choice is to throw it away. To wash their hair, astronauts use a special shampoo with a very small amount of water. Because they are in a weightless environment, they must be careful during washing to make sure that droplets of shampoo do not fly into the air. This makes it difficult to wash hair easily and get the pleasant feeling that normally comes from washing hair.

Kao deployed its technologies built up over many years to address these challenges of washing clothing and hair in space, and developed the *Space Laundry Sheet* to remove dirt, stains and odors from clothing without using water and the *3D Space Shampoo Sheet* to allow astronauts to easily wash their hair without using water.

■ Product details

▪ *Space Laundry Sheet*

The non-woven fabric sheets come impregnated with cleaning ingredient for use on clothing. Simply wiping clothing with the sheets without using water makes it possible to remove dirty stains and unpleasant odors. In a comparison of spot cleaning to remove dirt and stains, the sheets provided cleaning power equivalent to washing clothes in a washing machine with detergent. In addition, the sheets' antimicrobial and deodorizing ingredients keep clothing in a satisfying state.



▪ *3D Space Shampoo Sheet*

The non-woven fabric sheets have an uneven, three-dimensional shape and come impregnated with cleanser for use on hair. The raised bumps on the 3D sheet wipe away dirt and sebum from the scalp and roots of the hair while providing a massaging action for the scalp. The sheets do not need to be used with water, so astronauts can wash their hair without worrying about drops of liquid flying around in the weightless conditions of space. The sheets come with a refreshing, clean scent to provide an invigorating feel when washing hair.



Questionnaire results from astronauts about the two products*

Space Laundry Sheet

- It effectively cleans dirt and stains and removes odors from clothing.

- It also has a nice scent.
- Strong potential for this product to make the somewhat inconvenient daily activities onboard the ISS, where we have to lower our expectations from daily life on Earth, more comfortable.

3D Space Shampoo Sheet

- It's good at quickly making you refreshed after exercising.
- The shape and size are easy to use.
- It has a nice massaging quality.

* The questionnaire was given with a prototype and was not part of JAXA's screening.

<Related Information>

▪ **Household Products Research**

Conducts research and development on cleaning technologies to thoroughly remove dirt and stains, deodorizing technologies and antimicrobial technologies to control bacteria that cause unpleasant odors. It strives to make life cleaner and more comfortable to support people's daily lives and society through products including laundry detergents, kitchen cleaners, household cleaners, fabric conditioners and more.

▪ **Hair Care Products Research**

Conducts technology development to efficiently remove dirt and sebum from hair and the scalp and maintain a healthy scalp, and strives to realize cleanliness, beauty and health in daily living through hair care products including shampoos and conditioners that help hair to look and feel beautiful.