

## Development of High-Performance Superabsorbent Polymers Through the Use of Data Science

Nippon Shokubai Co., Ltd., (Headquarters: Osaka, Japan, President: Yujiro Goto, hereinafter “Nippon Shokubai”) successfully developed a novel superabsorbent polymers (SAP) by utilizing data science. The novel SAP have properties of 10% or more improvement in the absorption capacity and absorption speed compared with those of existing products.

Superabsorbent polymers (SAP) are primarily used in disposable diapers. The demand for disposable diapers is increasing globally, particularly for baby diapers in developing countries and adult diapers in developed countries. The features such as a dry feel on the skin, leakage prevention, no irritation of the skin, and compactness are required for disposable diapers, and SAP plays an important role in providing these characteristics. Nippon Shokubai has continually developed new SAP products since we commercialized superabsorbent polymers in 1985 for the first time; however, there were challenges in accelerating the processes of R&D, and commercialization in response to more diversified and sophisticated needs in recent years. To address the challenges, we introduced data science into the R&D of SAP, which often depended on experience and intuition in the past, to establish a system of rapid product design and commercialization with an accurate reflection of customer needs, while also offering proposals to customers. Today, all of our new SAP products are being developed based on this system.



Properties of superabsorbent polymers (SAP) have been required for improvements, which include absorption capacity under pressurized conditions assuming the application of body weight, absorption capacity without pressure, absorption speed, and distribution of liquid. We digitalized the information previously accumulated for the correlation between the performance of disposable diapers and SAP properties, analyses of behavior in SAP synthesis,

and control of SAP surfaces and then used data science of deep learning (machine learning) and informatics to achieve the successful development of an unprecedented, novel SAP product with 10% to 20% better properties. In addition, the development period was shortened to about half of the conventional development period. The newly developed SAP is scheduled for manufacture at the Himeji Plant and other production bases around the world and is expected to occupy 40% of our SAP by 2025.

Through this development, we will contribute to an improved response to the demands of disposable diaper users, including a dry feel on the skin, prevention of leakage, no irritation of the skin, and compactness.

Nippon Shokubai established the Data Science & Informatics Promotion Office in June 2020 and has promoted the use of data science not only for superabsorbent polymers but for a variety of different product categories, such as detergent ingredients and acrylic acid catalysts.

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About NIPPON SHOKUBAI Co., Ltd.: Since 1941, Nippon Shokubai has grown up its business with unique catalyst technology. Nippon Shokubai has supplied, for example, ethylene oxide, acrylic acid, automobile catalysts, process catalysts and so on. Among all, our global market share of superabsorbent polymers is the largest in the world now. Nippon Shokubai is a global chemical company operating under its corporate mission "TechnoAmenity-Providing affluence and comfort to people and society with our unique technology." <https://www.shokubai.co.jp/en/>

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