

November 8, 2024

Nagase & Co., Ltd.

Joint Development of a Sustainable Ice Nucleation Activating Substance: Using Tea Leaves and Rice Plants, and Reusing Their Waste Products—Contributing to Artificial Rainfall

Nagase & Co., Ltd. (Chiyoda-ku, Tokyo; Representative Director, President and CEO: Hiroyuki Ueshima), as part of the growth strategy in its Medium-Term Management Plan ACE 2.0, has specified the four quadrants of Foundation, Focus, Development, and Improvement, and is carrying out its businesses along the axes of the trading, manufacturing, and R&D functions. Nagase & Co., Ltd. and The school of Kansai University (Suita, Osaka; Chairperson of the Board of Trustees: Keiji Shibai) have acquired a patent*¹ after discovering through joint research that crushed plant material of natural origin, such as tea leaves and rice plants, has high effectiveness for ice nucleation activation. This initiative is part of the development of new businesses to contribute to a reduction of environmental burden, as part of the Development quadrant.

What Is an Ice Nucleation Activating Substance?

An ice nucleation activating substance is a collective term for substances that can promote the formation of ice crystals by acting as nuclei for the crystals when water is at a temperature below freezing and ice crystals begin to form. Generally, the freezing point of water is 0°C, but supercooled water*², in which ice crystals do not begin to form even when the water has been cooled to -10°C or below, also exists. By adding an ice nucleation activating substance to supercooled water, the water can be crystallized into ice, and this has also been applied for use in cloud seeding*³, which has received attention as a potential technology to deal with environmental issues. However, previous substances used as ice nucleation activating substances included deleterious substances such as silver iodide, and the development of a safer and more environmentally friendly material was sought after.

Future Expectations for This Initiative

This initiative was a joint effort between Nagase & Co., which has developed technical expertise and a wide-reaching network in both academia and industry as a chemical trading firm, and Kansai University, with its knowledge of ice crystal controlling substances, with the goal of researching and developing sustainable substances. The technology developed this time found that not only pristine tea leaves and rice plants, but also waste products such as used tea leaves, have potential for ice nucleation activation, and the environmental burden is expected to be reduced by both using and reusing naturally sourced substances. Ice nucleation activating substances make it possible for ice crystals to form at higher temperatures and are used to promote the formation of ice crystals, with one of their anticipated uses being cloud seeding to adjust rainfall amount and control the weather, as a way to respond to environmental issues such as water shortages and to reduce the damage from natural disasters.

The current plan is to cooperate with laboratories in Japan and overseas to carry out demonstration tests with the goal of licensing this technology. By building a business model in which waste products are



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upcycled with new added value, we aim to create a resource recycling society.

The NAGASE Group, as a company that solves manufacturing issues through materials, will contribute to a sustainable world where people live with peace of mind.

***1 Patent Summary**

Patent Number: Japanese Patent No. 7479652

Patent Holders: Nagase & Co., Ltd., Kansai University

Invention Name: Ice nucleation activator

Fixed URL for Viewing Patent: <https://www.j-platpat.inpit.go.jp/c1801/PU/JP-7479652/15/en>

***2** Supercooled water is water that remains liquid even below 0°C, when it would generally freeze. By causing an impact on this water and creating substances that could form seeds for ice (ice nuclei), the water will instantly freeze.

***3** It is possible to cause rain or snow to fall by distributing substances that promote the formation of ice crystals (ice nucleation activation substances) in clouds, speeding up the formation of ice crystals. Due to possibilities such as artificially adjusting the amount of rainfall, there are hopes that it could be applied to deal with environmental issues such as water shortages, food shortages, and forest fires.

Anticipated Uses of Ice Nucleation Activating Substances

- (1) Reduced energy consumption for freezing, cold storage, and refrigeration devices utilizing the property of freezing water at higher temperatures
- (2) Separation methods using freeze concentration
- (3) Cloud seeding for rain or snow, etc.

◆Inquiries

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