

JCCL Inc.
Toyo Seikan Group Holdings Ltd.
Mitsui & Co. Plastics Ltd.

**JCCL, Toyo Seikan Group Holdings, and Mitsui & Co. Plastics
Start a Joint Initiative for the Early Implementation
of CO₂ Capture Technology
- Reducing Environmental Impacts via Low-Cost, High-Efficiency Environmental
Technology -**

JCCL, Inc (“JCCL”; President: Toshiyuki Umehara), Toyo Seikan Group Holdings, Ltd. (“Toyo Seikan Group”; Tokyo 5901; President: Ichio Otsuka), and Mitsui & Co. Plastics Ltd. (“Mitsui & Co. Plastics”; President: Tatsumichi Sato) have agreed to advance a joint initiative to accelerate the early implementation of JCCL's CO₂ Capture technology toward the realization of a carbon-neutral society.



Overview and Background of This Initiative

To achieve a carbon-neutral society by 2050, technologies for the Capture of CO₂ are gaining attention. JCCL, a startup spun off from Kyushu University, has two types of advanced CO₂ capture technologies. By combining technology that separates and recovers CO₂ from flue gases produced by heavy oil and city gas combustion with technology that can directly separate CO₂ from the atmosphere (direct air capture: DAC), it is possible to recover low-concentration CO₂ from the atmosphere in a continuous process at a high concentration of 97–99%, with lower costs and higher efficiency compared to conventional technologies.

In this initiative aimed at reducing environmental impacts, JCCL will early implement its energy-efficient CO₂ capture technology. This will be in collaboration with Toyo Seikan Group, which will leverage its technology cultivated in the production of packaging containers, and Mitsui & Co. Plastics, which will use its sales network and other resources.

About JCCL's CO₂ Capture Technology

JCCL's CO₂ capture technology offers three key benefits: it efficiently uses waste heat that would otherwise be lost, reduces operating costs, and eliminates environmental risks associated with amine leakage and volatilization.

Effective Utilization of Unused Waste Heat

- JCCL's absorbent material, "amine-containing gel," efficiently absorbs CO₂ from exhaust gases and allows for easy desorption and recovery of absorbed CO₂ by simply supplying low-temperature steam at 40–60°C. This system harnesses waste heat from factories and other industrial sources that would otherwise go unused.

Reduction of Costs Associated With Recovery

- In conventional CO₂ recovery technologies from post-combustion gases, a large amount of energy is required due to repeated absorption and regeneration cycles several hundred times per day. In contrast, by using "amine-containing gel," JCCL's technology allows for recovery at a constant temperature with low-pressure steam, leading to reduced thermal energy consumption. As a result, recovery energy can be minimized by about one-fourth compared to conventional methods.
- It is less susceptible to moisture effects and demonstrates improved performance in environments with high relative humidity; this means that there is no need to dry absorbent material, thereby saving its costs and time.

No Risk of Amine Volatilization or Leakage

- Since it uses a polymer "amine-containing gel" as the absorbent material, there is no risk of environmental pollution due to the volatilization or leakage of amines, which is a concern with conventional absorbent liquids and solid absorbents.

Company Roles in This Initiative

Company	Role
JCCL	Improvement of CO ₂ separation materials and separation-recovery devices, along with the expansion of a global patent network aimed at the implementation of devices with CO ₂ recovery capacities of several tons or more
Toyo Seikan Group	Standardization, scale-up, and manufacturing of CO ₂ separation-recovery devices utilizing technological expertise developed in the production of packaging containers
Mitsui & Co. Plastics	Marketing aimed at establishing a global standard for this recovery process by leveraging expertise in market development and sales networks

Plan and Outlook

In fiscal year 2025, a demonstration experiment will be conducted using a small-scale recovery device (VPSA1) at the Kudamatsu plant of Toyo Seikan Group's Toyo Kohan Co., Ltd. We will

advance the evaluation of the durability of various materials, optimize the equipment from a practical perspective, and develop technology for mass production. Based on the validation results, we will work toward the implementation of a small device (CO₂ recovery capacity: 30 kg/day) in fiscal year 2025 and a container-type CO₂ recovery device (CO₂ recovery capacity: 300–500 kg/day) in fiscal year 2026. We are also progressing in the development of an energy-efficient DAC for the start of demonstration experiments within fiscal year 2025.

Additionally, we have begun collaborating with other partner companies on initiatives for the utilization of recovered CO₂. The three companies will work together to contribute to the realization of a carbon-neutral society by 2050 via the early implementation of energy-efficient CO₂ capture processes and CO₂ utilization models.

About JCCL

JCCL is a startup founded in 2020 that originated from Kyushu University; it is dedicated to the development of technologies and businesses aimed at reducing CO₂ emissions worldwide. The team, led by our founder and current CTO, Professor Yu Hoshino from the Graduate School of Engineering at Kyushu University, has developed a patented material called “amine-containing gel,” which applies the gas exchange system found in living organisms.

Using this as our core technology, we manufacture CO₂ absorbent materials that do not require a drying process, and we are commercializing CO₂ recovery devices that achieve low-cost, high-performance processes. A significant feature of our CO₂ recovery devices incorporating our absorbent materials is the substantial reduction in recovery costs. Our recovery process allows for desorption simply by flowing low-pressure steam at around 50 °C, which can reduce energy costs to about one-fourth compared to methods using conventional amine absorbent solutions.

We have multiple achievements, including participation in national-level projects, inquiries for our devices from major companies, and various contract testing, and we are now advancing several projects concurrently. Moving forward, we will continue to implement our technology in society and contribute to solving the challenges toward Japan’s goal of achieving carbon neutrality by 2050 and global CO₂ recovery and utilization. <https://jccl.jp/en/>

About Toyo Seikan Group Holdings

Toyo Seikan Group Holdings, Ltd. is a world-class comprehensive packaging manufacturer that delivers a variety of packaging containers using materials such as metal, plastic, paper, and glass. The company’s Long-Term Management Vision 2050—The Future, Wrapped for All—aims to go beyond the traditional field of packaging by becoming a corporate group that creates new value that changes society. Founded in 1917, Toyo Seikan Group Holdings conducts business globally, with 44 companies in Japan and 50 companies abroad. It employs a multinational workforce of 20,000 people. <https://www.tskg-hd.com/en>.

About Mitsui & Co. Plastics

Mitsui & Co. Plastics is a specialized trading company that handles a wide range of chemicals, from various synthetic resin materials and product sales to chemical ingredients, functional films, and

electronic component-related materials. It proposes solutions to industrial challenges in various fields, such as automotive, food packaging, building materials, and advanced electronics, and it is expanding its global business by utilizing Mitsui & Co.'s extensive domestic and international network to create new value.

"Business development toward building a circular economy" is one of this company's core pillars. It actively promotes environmental-related businesses tailored to industry and application, including "CCUS," "recycling," "biomass," and "biodegradable" materials.

Founded in 1947, this company has seven domestic bases and approximately 630 employees, including those working at Mitsui & Co.'s overseas bases. <https://www.mitsui-plastics.com/en/>

For inquiries about this press release, please contact:

Babasaki / Mori

Business Development Dept.

JCCL, Inc

(Email) inquiry@jccl.co.jp

Nakanori / Takada / Kakimoto

Corporate Communication Group

Sustainability Department

Toyo Seikan Group Holdings, Ltd.

(Email) tskg_contact@tskg-hd.com

Koga

Circular Economy Development Department.

Mitsui & Co. Plastics Ltd.

(Email) MBP-TGSG-TKZCL@mitsui-plastics.com