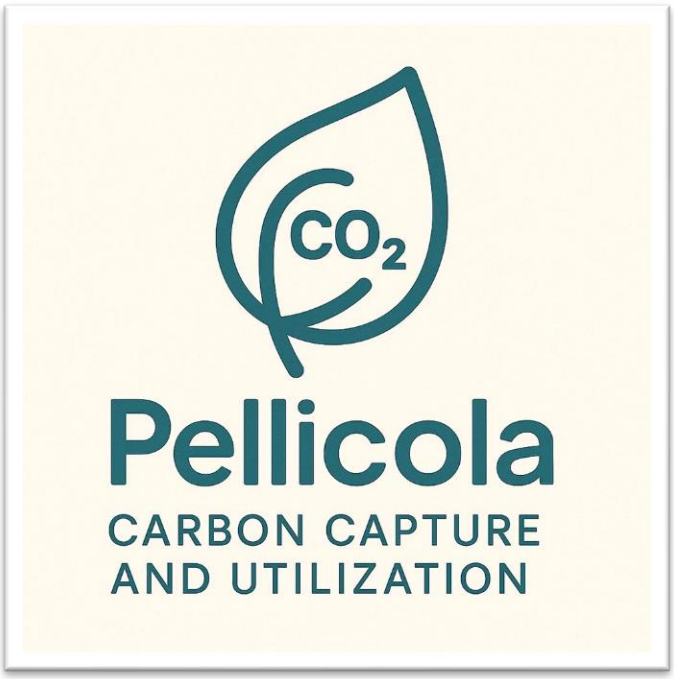

ABSTRACT

Pericola is a next-generation, ambient-condition CO_2 capture material based on nanostructured natural zeolite. It offers a breakthrough approach for carbon capture, transport, and conversion—particularly suited to Japan's innovation-driven, high-density, and sustainability-focused markets.

Shugo Nakano
President Cielo

The Vision:

Buildings that aren’t just net-zero, but net-positive — actively improving urban air quality.

Imagine a building that doesn’t just stand in a city—it cleans it. Pellicola is a nano-engineered natural zeolite that, when integrated into concrete or building surfaces, transforms entire structures into passive air purifiers.

Unlike conventional materials, Pellicola actively adsorbs CO_2, VOCs, and nano-sized pollutants from the air. It’s fast, reversible, and doesn’t rely on complex machinery—just smart design.

Applied as a surface coating, mixed directly into concrete, or embedded in modular panels, Pellicola gives architects and developers a way to turn walls, façades, and interiors into functional, sustainable infrastructure. Cleaner air, healthier cities, smarter buildings.

Ours is a multi-domain innovation: materials science + environmental tech + architecture

Shugo Nakano

President Cielo KK

Pellicola + Concrete =

CO_2-Absorbing Buildings

We've developed a highly advanced, reusable zeolite-based material capable of capturing nano-sized pollutants—including PFAS and CO_2—far more effectively and simply than current synthetic solutions. Our material performs better, costs less, and aligns with nature's logic rather than trying to out-engineer it.

Basic Concept:

- You **embed Pellicola particles** (the treated natural zeolite) into concrete during mixing or as a surface coating.
- Once cured, the building **passively adsorbs CO_2** from the air through these integrated zeolite structures.
- Unlike raw concrete, Pellicola:
    - Adsorbs CO_2 **much faster**
    - Holds it **reversibly** (can release if needed)
    - Captures even **nano-scale pollutants** (e.g. VOCs, PFAS, CO_2)

Why It Works Better Than Ordinary Concrete:

Feature	Standard Concrete	Concrete + Pellicola
CO_2 Reaction	Slow & permanent (carbonation)	Fast & reversible (adsorption)
Efficiency	Shallow surface penetration	Nano-structured capture
Other Toxins	Not effective	Removes VOCs, PFAS, NOx, etc.
Regeneration	Not possible	Can be regenerated by heat/pressure

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How to Apply Pellicola in Construction:

1. Bulk Integration:

- Mix Pellicola powder into cement during production.
- Acts like a **functional filler**, providing CO_2-capture properties without altering strength.

2. Surface Coating:

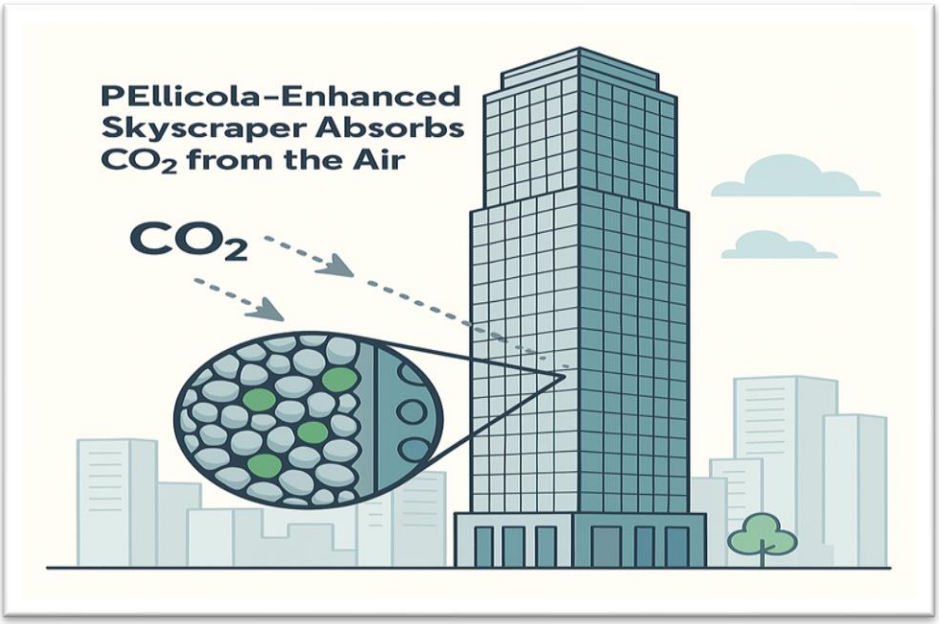
- Spray or brush a Pellicola-rich coating onto interior/exterior walls.
- Creates an **active CO_2-adsorbing façade**.

3. Modular Panels:

- Use Pellicola-loaded panels or tiles for **ventilation zones**, **ceilings**, or **wall cladding**.
- Can be designed for **periodic regeneration** in smart buildings.

Imagine This—turning buildings into **urban air filters**.

- A **skyscraper becomes a vertical CO_2 sponge**.
- It breathes in polluted city air.
- Internally, walls and façades capture CO_2 and toxic gases.
- Smart systems occasionally **"wring out"** the Pellicola via heat or vacuum to release the gas for recycling or sequestration.



Pellicola vs. Synthetic Zeolites: Key Advantages

Feature	Pellicola (Modified Natural Zeolite)	Synthetic Zeolite
Source	**Derived from natural zeolite, eco-friendly base**	**Fully man-made, energy-intensive production**
Nano-structural Tuning	**Advanced modification with precise pore control**	**Often too rigid or optimized for industrial uses**
Toxin Range	**Adsorbs nano-sized toxins (e.g., PFAS, VOCs, CO_2)**	**Limited to larger molecules; poor PFAS capture**
Reversibility	**Reversible adsorption (desorption with heat/pressure)**	**Many types are single-use or less efficient**
Safety & Stability	**No toxic byproducts; naturally stable**	**Some types may leach aluminum or degrade under stress**
Green Building Integration	**Easily blends into concrete, coatings, or panels**	**Rarely used in construction materials**
Environmental Footprint	**Lower processing energy and sustainable origin**	**Higher carbon footprint during production**
Customization	**Tuned specifically for air purification and CO_2 capture**	**Typically built for industrial catalysis or detergents**
Cost-Effectiveness	**Lower long-term cost due to reusability and material cost**	**Often more expensive for large-scale applications**

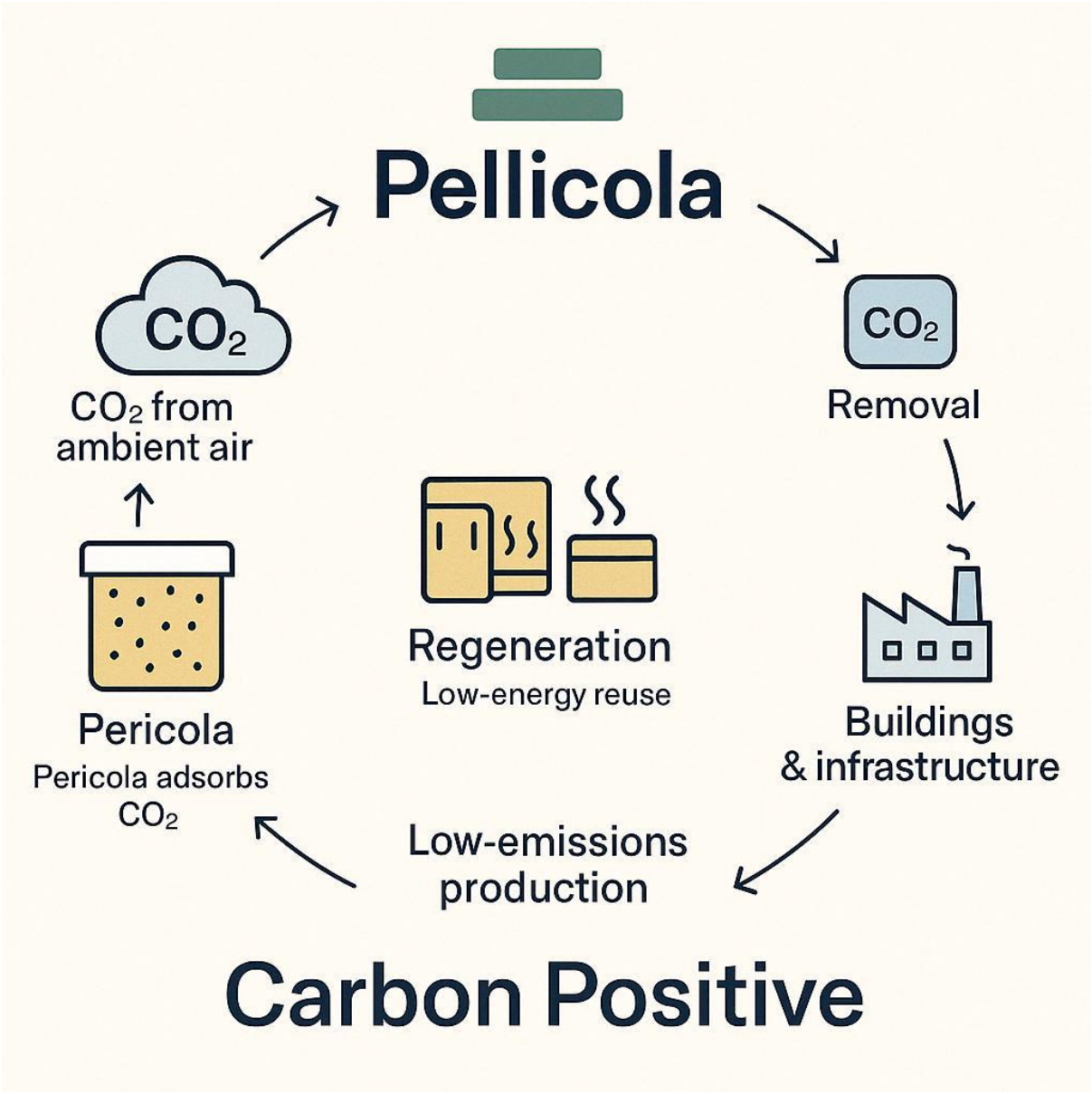
synthetic zeolites can capture CO_2 under controlled conditions **— but for real-world, urban environmental applications like Pellicola aims for, they're less effective and less practical.**

Pellicola is designed specifically for urban sustainability, not just industrial filtration. Its natural origin + cutting-edge engineering make it ideal for:

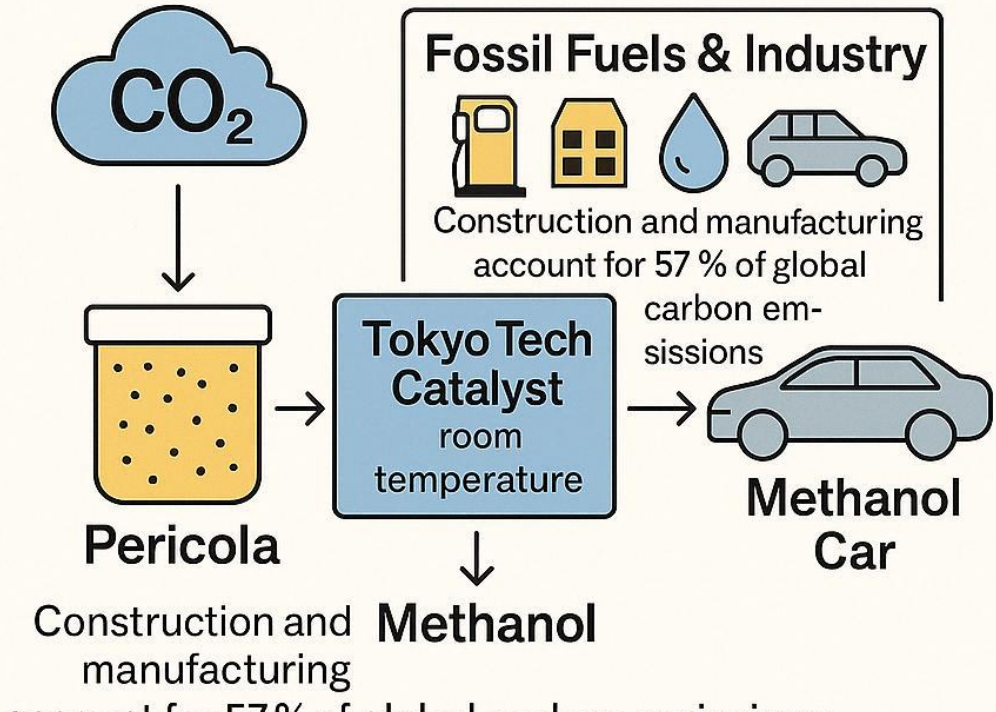
- Green building integration
- Passive carbon capture
- Air quality improvement in urban areas

Technical Summary

- Mixes with cement to improve the strength and durability of concrete
- ZEB = Zero Emission Building materials
- CO2 Separation and recovery CO
- Clean petrol feedstock
- The most important component of the recovery system is the choice of recovery material
- Amines compounds Liquid Target price JPY 1,500/kg Difficult to achieve
- Organic MOF work frame Solid ibid
- Carbon nanotubes Solids ibid
- Silica gel Solid Low performance
- Room temperature and pressure Separation and recovery Long-term storage possible


Pellicola
CO_2
CO_2 from ambient air
CO_2
Removal
Regeneration
Low-energy reuse
Pericola
Pericola adsorbs CO_2
Buildings & infrastructure
Low-emissions production
Carbon Positive

From CO_2 Capture to Methanol Fuel for Cars

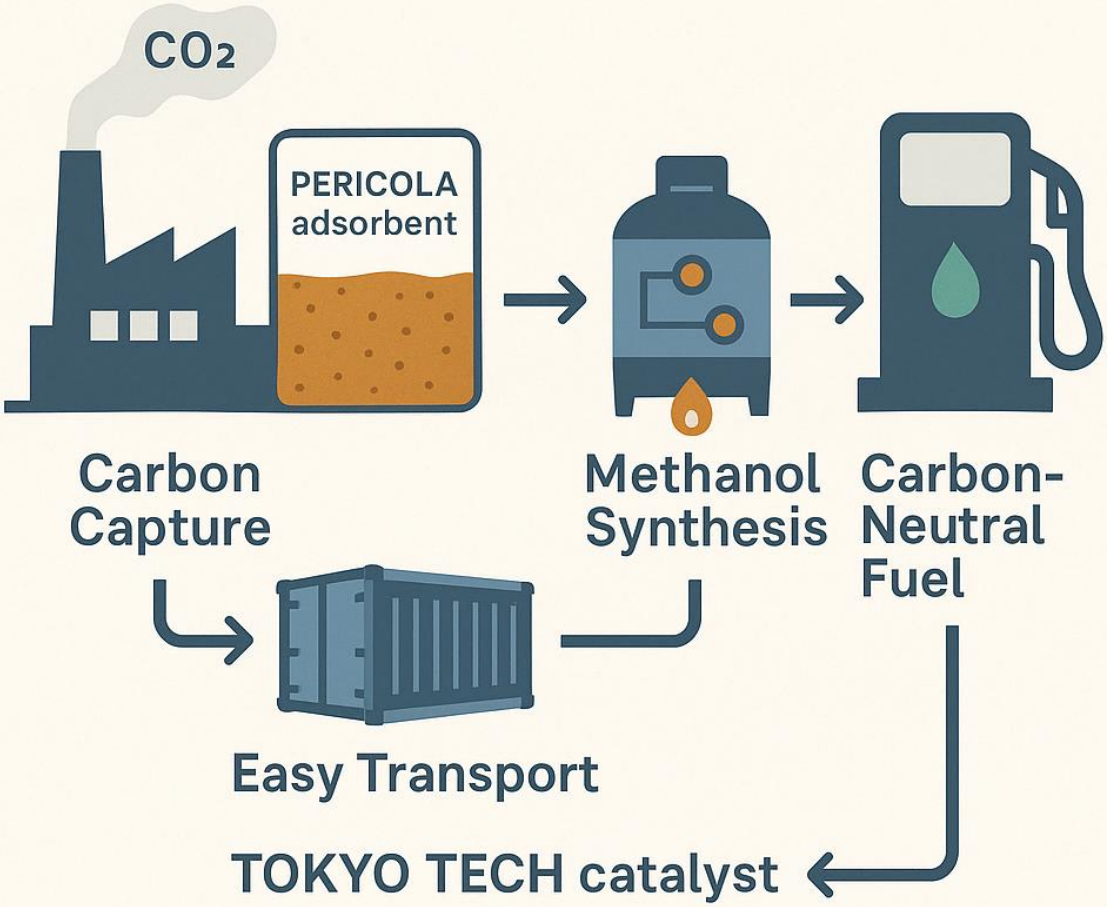


Construction and manufacturing account for 57 % of global carbon emissions

From CO_2 captured by Pericola to methanol fuel for cars

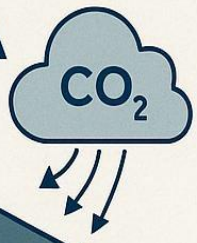
PERICOLA + TOKYO TECH CATALYST

Modular Generation of Carbon-Neutral Fuel

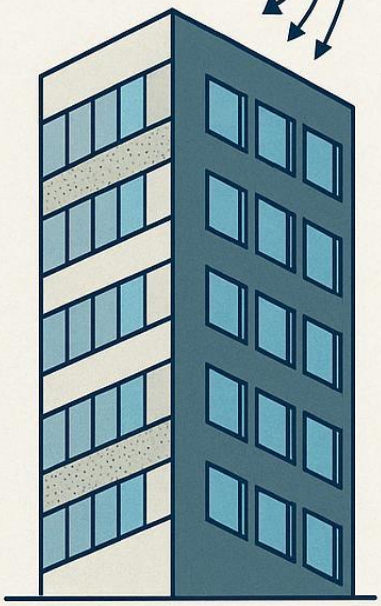


PELLICOLA

CO_2-ABSORBING MATERIAL

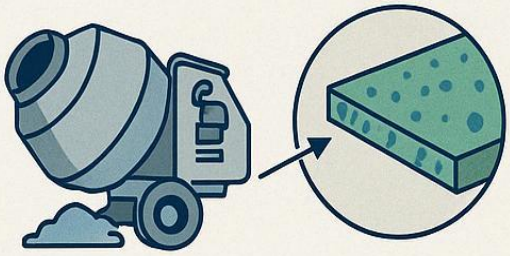


Incorporates natural zeolites as enables the absorption of carbon dioxide directly from the air.



TECHNOLOGY

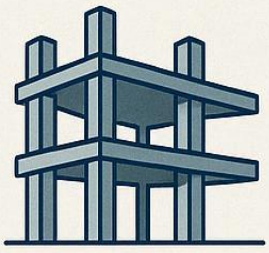
Additive for Construction Materials



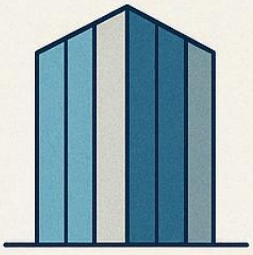
Blended into concrete, panels or coatings for new and existing buildings

High-capacity zeolite properties bind CO_2 passively at ambient temperature

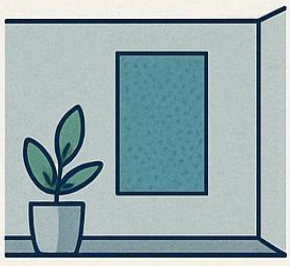
APPLICATIONS



Carbon-negative cement & concrete



CO_2-sequestering facade coatings



Indoor air purification panels

Pellicola products manufacture:

- Carbon-negative cement & concrete