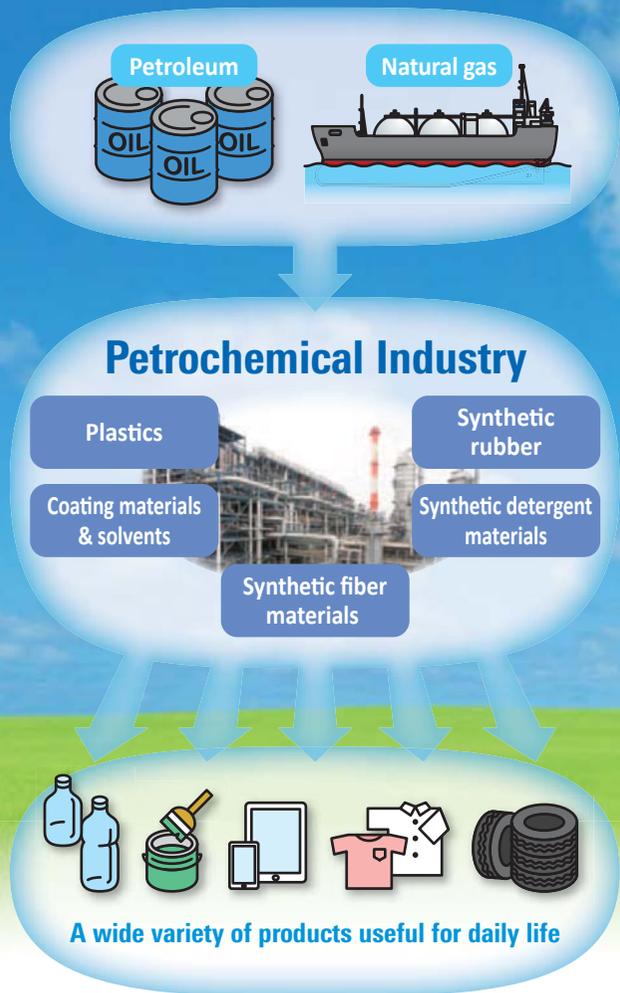


Sustainable Carbon Chemistry

The petrochemical industry provides a variety of products useful for human life using resources such as petroleum. Japan's petrochemical manufacturers have adopted Sustainable Carbon Chemistry as a new concept focused on contributing to sustainable development for the Earth and humankind.



Sustainable Carbon Chemistry
– For the Future

This logo comprises the letter “C” twice to indicate the initials of “carbon” and “chemistry”, with another “C” rotating around to represent the circulation of carbon enveloping the earth.

Members of the Association

- | | |
|--|---|
| Asahi Kasei Chemicals Corp. | Mitsubishi Rayon Co., Ltd. |
| Daicel Corp. | Mitsui Chemicals, Inc. |
| Denki Kagaku Kogyo K.K. | Nippon Shokubai Co., Ltd. |
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| KH Neochem Co., Ltd. | Tonen Chemical Corp. |
| Kuraray Co., Ltd. | Tosoh Corp. |
| Maruzen Petrochemical Co., Ltd. | Ube Industries, Ltd. |
| Mitsubishi Chemical Corp. | ZEON Corp. |
| Mitsubishi Gas Chemical Co., Inc. | |

1 October, 2014

*What is
“Sustainable
Carbon
Chemistry”?*



*Think about
Sustainable Carbon
Chemistry!*



JAPAN PETROCHEMICAL INDUSTRY ASSOCIATION
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TEL: 81-3-3297-2019

<http://www.jpca.or.jp>

JAPAN PETROCHEMICAL INDUSTRY ASSOCIATION

The total amount of carbon in the world is fixed. Carbon exists in CO₂ in the air and the sea, in carbohydrates of plants and animals, and in hydrocarbons of fossil fuels. As it circulates between different forms, carbon plays an important role in maintaining the balance of the Earth's ecosystem. We must overcome a variety of challenges in order for humankind to coexist with the Earth in symbiosis while preserving this balance.

Finite Resources

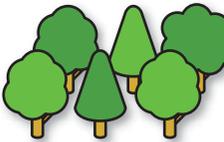
The availability of carbon-rich resources such as petroleum continues to grow due to the advancement of extraction technology, and depletion is not an immediate concern. But because such resources are finite, we must nevertheless utilize them efficiently.



Global Warming

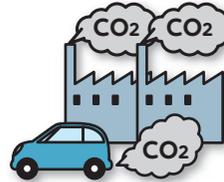
CO₂ should be in balance

The natural cycle of absorption and emission of CO₂ in the air and the sea is generally in balance.



Imbalance from the Industrial Revolution

Since the Industrial Revolution, the use of fossil fuels and deforestation by humankind have increased the amount of CO₂ in the atmosphere, contributing to global warming.



CO₂ decreases

- Oceanic absorption
- Plant photosynthesis

CO₂ increases

- Deforestation
- Industrial activity
- Oceanic emission
- Emission from plants and animals

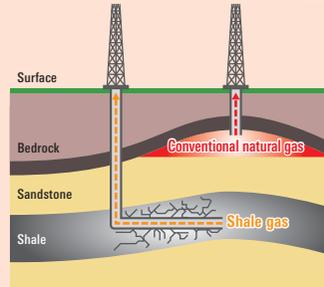


Diversification of resources

In addition to petroleum, valuable carbon resources include natural gas, shale gas, and even coal.



Coal



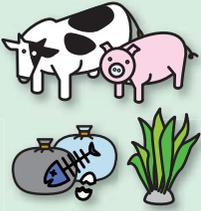
Shale gas

New carbon resources

The petrochemical industry will increasingly develop and use biomass and artificial photosynthesis as new carbon resources in addition to oil, gas, and coal.

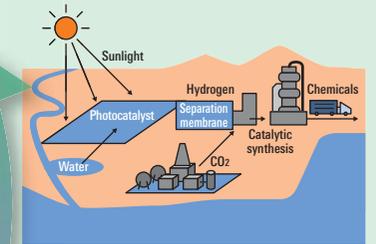
Biomass

Biomass is a renewable organic resource derived from living organisms, such as plants, household waste, and livestock manure. Technology to produce chemical products from CO₂ using algae is under development.



Artificial photosynthesis

Research on artificial photosynthesis aims to produce basic chemicals from CO₂ and water using solar energy.



Products contributing to human health and longevity



Medical devices



Artificial organs

Coping with food and water issues



Water treatment with hollow-fiber membranes



Vegetable factory

Eco-products

Eco-products include weight-saving material and biodegradable plastic.



Lighter vehicles



Lighter airplanes



Lithium-ion batteries

Effective use of carbon resources



Sustainable Carbon Chemistry – For the Future

Humankind needs to achieve a sustainable carbon cycle by minimizing CO₂ emissions and utilizing limited carbon resources as effectively as possible.

The petrochemical industry is advancing technological innovation to establish and maintain a sustainable carbon cycle, while providing mankind with advanced new materials having highly innovative functions that meet future needs for saving energy, environmental preservation, health & longevity, and the security of food & water.

Use of CO₂ as a resource

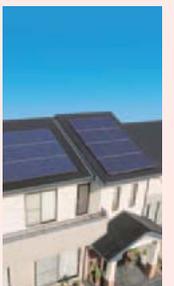
Reduced CO₂ emissions

Advanced materials for new energy sources

The petrochemical industry provides highly advanced materials that enable the utilization of renewable energy sources, contributing to reduced CO₂ emissions.



Wind power



Solar power (photovoltaic)