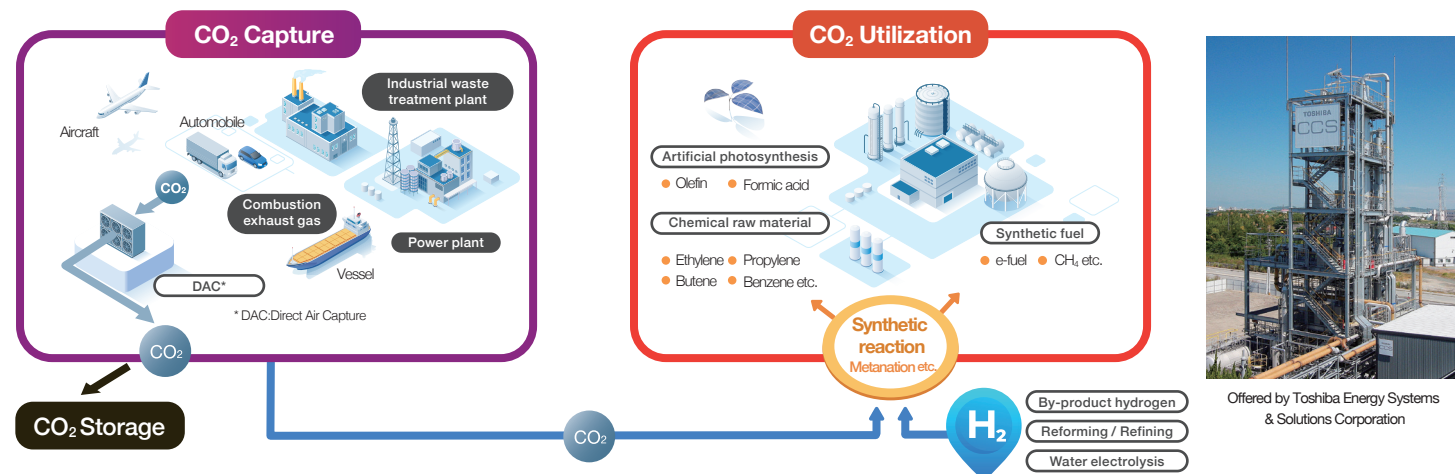


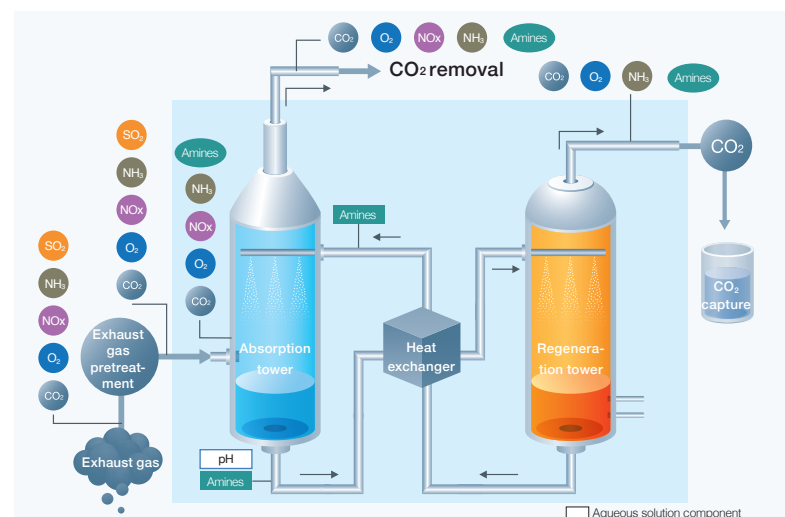
In order to achieve carbon neutrality and combat climate change, it is important to reduce carbon dioxide (CO₂) emissions from thermal power generation, steel industry, chemical industry, cement industry, etc. Globally, the development and practical application of "carbon recycling technology" to recover and effectively use CO₂ as a resource is now underway.



Capture

CO₂ is separated using the most appropriate technology based on the size, concentration, and pressure of the CO₂ source.

Chemical Absorption (Amine)

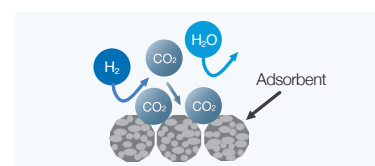


"Chemical absorption" is a method of separation using a chemical reaction between CO₂ and an aqueous amine solution and is widely used nowadays.

Since it is necessary to monitor various types of generated gases such as CO₂ in each process of the Chemical Absorption, we propose equipment systems and sampling methods that meets customer's requirements.

In addition, structural analysis by water quality meters and Raman spectroscopy is effective for identifying changes in the state of amine solutions and in determining the timing of replacement or additional injection.

Physical Adsorption



Physical Adsorption is a capturing technology in which CO₂ is adsorbed onto an adsorbent (porous solid such as activated carbon or zeolite) and then desorbed by decompression or heating.

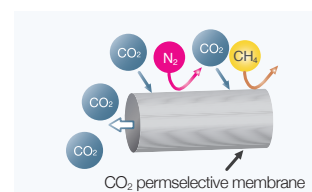
Evaluation of Adsorbents

Raman microscopy, which captures the bonding state of substances, can be used to observe changes in state, such as adsorption, that occur on the zeolite surface. It is useful for performance evaluation and degradation analysis of adsorbents.

Raman Microscope
XploRA PLUS



Membrane Separation



Membrane Separation is a technology that uses polymer membranes with CO₂ separation function to selectively separate and recover CO₂ by pressure difference.

Reaction Efficiency of Membrane / Evaluation of replacement time

Measuring the amount of carbon attached to the separation membrane after the reaction and the amount of sulfur in the catalyst with EMIA-Step and evaluating the degradation level of membranes and catalysts can be useful for predicting the reaction efficiency and replacement cycle of membranes.

Carbon/Sulfur Analyzer
EMIA-Step



Gas Measurement Solutions

High concentration gas measurement

Multi-Component Gas Analyzer
VA-5000 Series



Stack Gas Analysis System
ENDA Series



Low concentration gas measurement

Trace Gas Monitor
GA-370



Ambient NO_x Monitor
APNA-370



*Contact us for the combination of gas components to be measured and equipment.

Amine Solution Measurement Solution

Field-installation Type pH / Conductivity Meter
H-1 Series



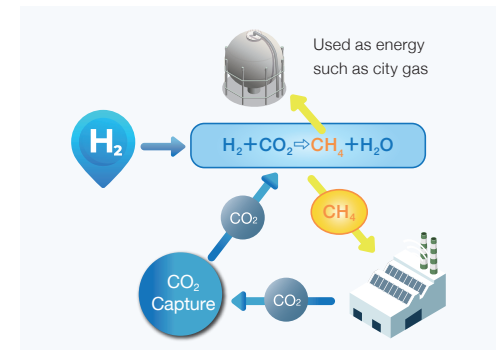
Process Raman Systems



Utilization

By using technologies such as methanation, absorption / immobilization and artificial photosynthesis to use CO₂ as a synthetic raw material for chemicals and fuels, efforts are being made to reduce CO₂ emissions into the atmosphere and effectively use it as a resource.

Methanation



"Methanation" is a technology for synthesizing hydrocarbon compounds such as CH₄, the main component of natural gas, from H₂ and CO₂.

Impurity Monitoring

HORIBA offers various gas analyzers such as CH₄, CO₂, etc. in combination with optimal sampling system for monitoring on different stages from R&D to real process monitoring, based on the analysis and measurement technologies we have cultivated over the years.

We also have extensive experience in monitoring desulfurization, which is necessary for the pretreatment of methanation processes.

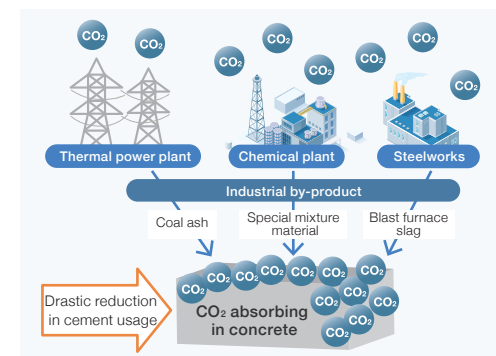
Multi-Component Gas Analyzer
VA-5000 Series



Explosion-proof Gas Analyzer
TIA-51d/p



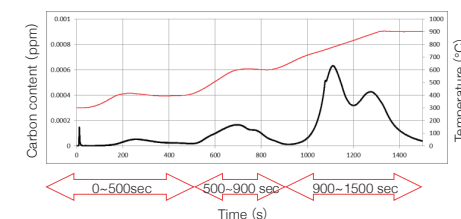
Absorption / Immobilization in concrete materials



To reduce CO₂ emissions, research is being conducted on "CO₂ fixation": absorption and fixation of CO₂ in concrete.

By substituting industrial by-products for cement, which emits large amounts of CO₂ during production, the total amount of CO₂ emissions during concrete production can be reduced.

Measurement of CO₂ Fixation

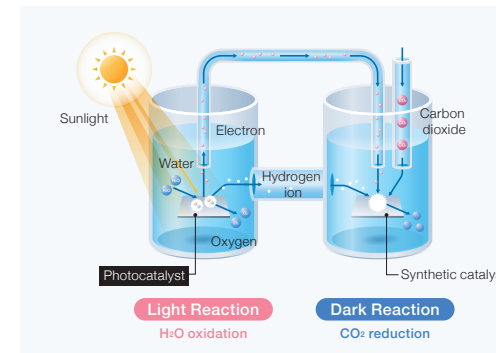


EMIA-Step is capable to raise the temperature of the sample and to perform temperature rising analysis of carbon amount. That enables the measurement of changes in reduction amount, depending on the temperature of adsorbed CO₂.

Carbon/Sulfur Analyzer
EMIA-Step

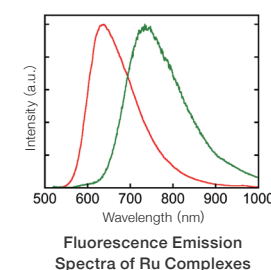


Artificial Photosynthesis



"Artificial Photosynthesis" is a technology for synthesizing chemicals from water and CO₂ using solar energy and photocatalysts.

Evaluation of Luminescence Properties in the Near-Infrared Region



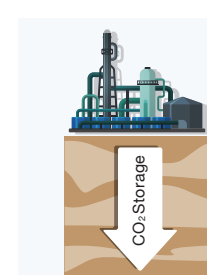
Duetta can detect spectra as long as 1,000 nm, making it possible to evaluate luminescence properties in the near-infrared region. It will contribute to improving the reaction efficiency of catalytic materials.

Fluorescence and Absorbance Spectrometer
Duetta



• Data offered by Ishitani Laboratory, Tokyo Institute of Technology

Storage



CO₂ separated and recovered from large-scale sources of CO₂ emissions is stored in underground or in strata of the ocean floor.

CCS

"CCS" is a technology for stably storing nearly 100% of the separated and recovered CO₂ in a reservoir more than 1,000m deep underground.

Measurement of CO₂ storage gas concentration

Gas analyzer 51 series are explosion-proof and allows constant CO₂ measurement at the CO₂ recovery outlet (storage inlet).



Explosion-proof Gas Analyzer
EIA-51d/p

CCUS Related Websites

The following websites provide more detailed information about our solutions.



Process Gas



Carbon Recycling