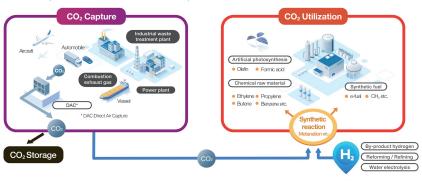
Application Navi for Carbon dioxide Capture, Utilization and Storage

CCUS Navi

We will contribute to the realization of a carbon-neutral society with our "measuring" technologies.

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

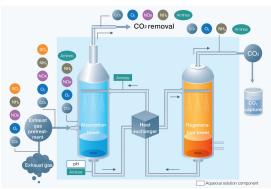




Offered by Toshiba Energy Systems & Solutions Corporation

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

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.

Gas Measurement Solutions

High concentration gas measurement

Multi-Component Gas Analyzer VA-5000 Series





Low concentration gas measurement

Trace Gas GA-370



Ambient NOx APNA-370



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

Amine Solution Measurement Solution

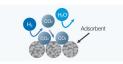
Field-installation Type pH / Conductivity Meter H-1 Series



Process Raman Systems



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

Microscope

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



Membrane Separation



Membrane Separation is a technology that uses polymer membranes with CO₂ separation function to selectively separate and recover CO: 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 FMIA-Step and evaluating the degradation level of membranes and catalysts can be useful for predicting the reaction efficiency and replacement cycle of membranes



HORIBA

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

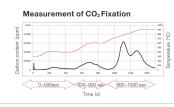


Absorption / Immobilization in concrete materials



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

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.



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

Evaluation of Luminescence Properties in the Near-Infrared Region



Spectra of Ru Complexes

Fluorescence and Absorbance

Spectromete

evaluate luminescence properties in the near-infrared region. It will contribute to improving the reaction efficiency of catalytic

Duetta can detect spectra as long as 1,000 nm, making it possible to



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" 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 is 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





Carbor

Recycling

Bulletin: HRE-3774A

