Task 4. Investigation for Deploying Demonstration Projects

Background and goals

- Distance and frequency of shuttle ship transportation, monitoring methods, etc., depend on the location and properties of the demonstration site.
- Preliminary assessment for potential environmental impacts and establishment of CO2 monitoring technologies in deep water are required.
- It is important to understand the basic properties of CO2 hydrate barrier layers in deep water, which has potential to seal CO2 leakage routes.
- For a successful integrated CCS demonstration project, we have to plan it by examining each issue and optimizing the whole system.

Details

1. Review of demonstration sites

Evaluation of results of 2D/3D seismic survey to be conducted in "Investigation of Potential CO2 Storage Site" project. Review of extra surveys and content to be required to conduct a sustainable CCS demonstration project. Review of demonstration sites considering transportation distance from capture facilities, and the sea environment, etc.

3. Plan of integrated CCS demonstration project

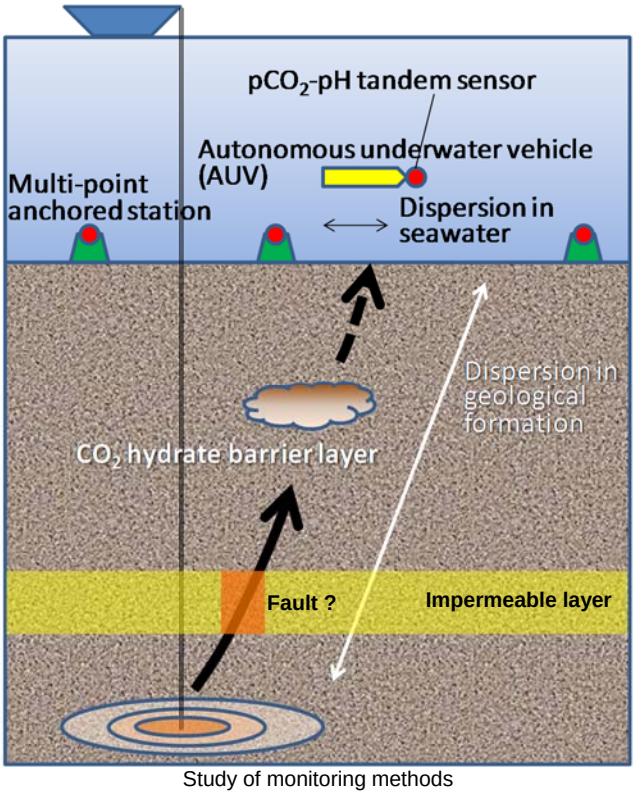
Review of issues of each element, risk reduction methods, and optimization of the whole system, targeting an integrated project ranging from CO2 separation and capture at coal-fired power plants, shuttle ship transportation, storage, and monitoring.
Examination of project plan that matches demonstration plan for each system element by gathering results of trial cost calculations and schedules for each system element.

2. Study of Monitoring Methods

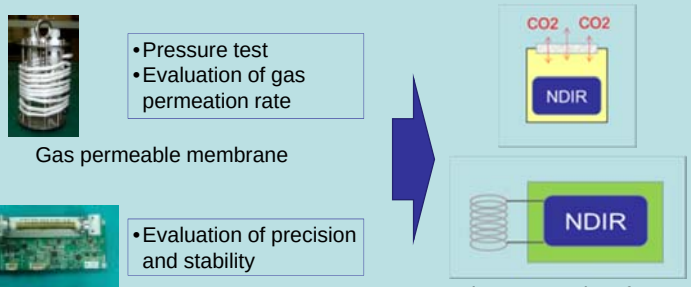
a. Study of basic properties of CO2 hydrate barrier layer under seafloor
- Evaluation of the basic properties during the barrier formation stage
- Identification of conditions required for the sediment of storage sites under the seafloor
- Development of a hydrate crystal growth model
- Evaluation of long-term, stable CO2 storage with the barrier layers

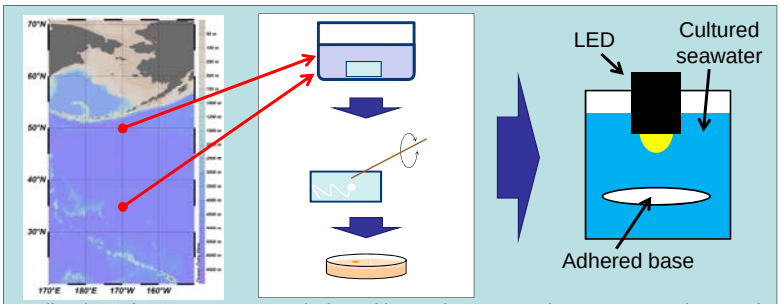
b. Simulation of CO2 leakage and dispersion into water
- Development and validation of a simulator to estimate CO2 leakage points and amounts based on sensor data
- Development of a 3-phase (solid-liquid-gas) flow simulator for sedimentary formations and development of a leakage amount estimation method

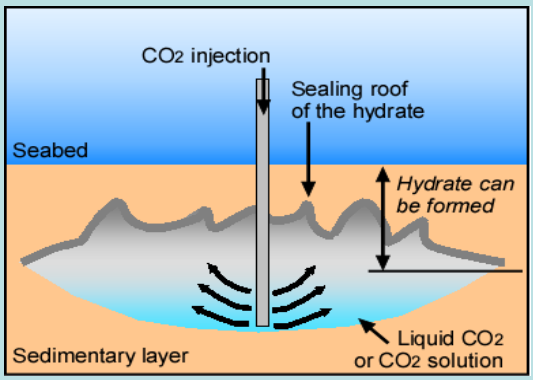
c. Optimizing a continuous monitoring system to detect CO2 leakage
- Investigate and research the technical trends of deep sea monitoring systems, CO2 sensors, and anti-biofouling technologies
- Development and performance tests of prototype pCO2 sensors
- Validation of anti-biofouling technologies using a land-based flow-through seawater tank



Study of monitoring methods

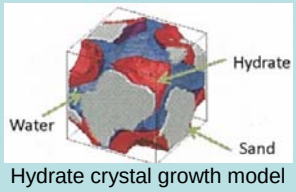






CO2 hydrate barrier layer formation


Test equipment to evaluate basic properties of CO2 hydrate barrier layer



Hydrate crystal growth model

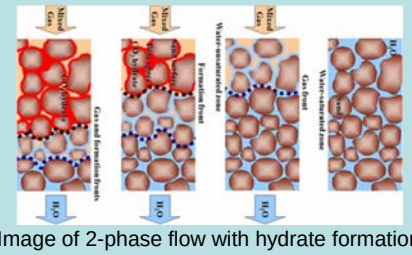


Image of 2-phase flow with hydrate formation