Search for suitable sites of CO₂ storage using CO₂ hydrate

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A common type of CO2 geological storage is aquifer storage. In this method, an ultrafine-grained layer that is impermeable to water and gas is used as a cap rock, and its geological structure is used to store CO2 underground, and a monitoring and verification test is being conducted off the coast of Tomakomai. However, sites suitable for aquifer storage may not exist anywhere near Japan due to the geological structure, and searching for them may require a lot of time and effort.

One of the methods to expand the possibility of underground storage is the development of a storage method using CO2 hydrate as a seal layer (CO2 hydrate storage). In CO2 hydrate storage, first, CO2 hydrate that forms a seal layer under the sea floor is generated. Since CO2 hydrate is generated at a lower temperature than methane hydrate, a lower seabed temperature can form a seal layer more safely. Under these conditions, we will search for the best place and sea area for storage. As an application, we decided to use the knowledge of the methane hydrate production field. There may be many possible sedimentary basins in the waters around Japan. However, in order to store a certain quantitative scale more safely and stably, in addition to seafloor temperature, geothermal gradient, strata thickness, horizontal spread, sediment type, sediment particle size (porosity, permeability) needs to be considered in detail. Above all, permeability is a very important factor, and from this perspective, diagenetic old strata should be avoided. The stratigraphic age is at most the Pliocene or Pleistocene strata since the late Miocene.

On the other hand, it is necessary to set a place that must be avoided in consideration of safety. It is assumed that 1) area of methane hydrate occurrences, and 2) active fault zones. 1) As CO2 hydrate is an exothermic reaction, if it overlaps with MH, there is a concern that it may decompose MH that is stably present. 2) Next, regarding active faults, active faults often exist on the edge of the sedimentary basin. Because faults play a role in basin formation, if CO2 is widely stored under the basin, is it not affected by the active fault activity (earthquake) or, conversely, has an effect on the active fault? It will be necessary to study and experiment whether there is nothing.

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