

Sedimentary environments and pore properties of subseafloor sediments in the eastern margin of Japan Sea

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Sediment samples below the seafloor were retrieved as long as 40 meters at the Umitaka Spur, Joetsu Channel, Toyama Trough, Japan Basin, Nishi Tsugaru and Okushiri Ridge areas in the east margin on Japan Sea. Small amounts of sandy sediment have been retrieved as thin intercalations in Pleistocene and Holocene muddy layers, where trace fossils and strong bioturbations are commonly observed. Those sandy sediments consist of very fine- to fine-grained sands, and are sometimes tuffaceous. These sandy sediments might have been transported approximately around 3 to 30 ka according to the tephra ages, where supplying sediments might have not been abundant due to sea level fluctuation during the Pleistocene ice age.

It is important to clarify the relationship between burial depths and absolute porosities of the argillaceous sediments. Therefore, macroscopic observations and descriptions, measurements of porosities and the pore size distributions, thin-section observations, SEM (scanning electron microscope) observations, and the X-ray diffraction analyses have been performed. They consist of silt- to clay-grained particles, and they sometimes contain very fine- to medium-grained thin sandy layers. Average porosities are 50 % in all study areas, but mean pore sizes in the Nishi Tsugaru are around 1000 nm while 100 nm in the other areas, which tend to decrease as increasing of depths. It is suggested that repacking of the muddy particles dominantly advances by physical compaction in early diagenesis.

They generally contain much opal-A, quartz, feldspar, illite and smectite that do not change definitely with depth, because they are tuffaceous and are suffered only from early diagenesis. By optical and microscopic observations, diatom tests, foraminifers and framboidal pyrites are commonly observed, and, in particular, the shapes of diatom are usually various, dominantly fragmental and infrequently preserved.

The sedimentological properties of subseabottom argillaceous sediments in early diagenesis can be discussed in terms of physical and geochemical aspects such as porosity, permeability, pore size distribution, diagenetic mineral composition as well as microscopic observation. It is remarked that the physical diagenesis proceeds first as repacking of clastic grains due to mechanical compaction, whereas the chemical diagenesis advances very slowly in early diagenesis.

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Keywords: hydrate, Japan Sea, pore