

Lipids analysis of methane hydrate bearing sediments from the Nankai Trough by two dimensional gas chromatography

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Lipids analyses were done using comprehensive two dimensional gas chromatography (GC x GC) to clarify the bacterial communities and activities with drilled sediment cores of methane hydrate (MH) zone in the eastern Nankai Trough. GC x GC has two capillary columns with different stationary phases. The separation power of the first column is converted into the second column, such that compounds not resolved by the first column. In this study, we attempted to separate and identify biomarkers in the sediment cores by GC x GC-qMS. We also compared lipids distributions of surface sediment with those of methane hydrate bearing zone at three locations, Tokai-oki, Daini-Atsumi knoll and Kumano-nada.

The sediment samples were collected from Tokai-oki, Daini-Atsumi knoll and Kumano-nada with METI exploratory test wells "Tokai-oki to Kumano-nada" in 2004. The lipids were extracted by methanol/dichloromethane, and then extract was saponified with 0.5 mol KOH/methanol. The neutral fraction was converted to trimethylsilyl esters (TMS) by BSTFA. The TMS-derivatives were analyzed using a ZOEK KT2006 comprehensive GC x GC-qMS equipped with columns BPX-5 and BPX-50.

The neutral lipids fractions of all samples mainly consist of n-alkanes, acyclic isoprenoids, n-alcohols, sterols and hopanols. Although the neutral lipids compositions in MH bearing zone were comparatively similar between at Tokai-oki and Daini-Atsumi knoll, those at Kumano-nada was different from those at others. 2,6,10,15,19-pentamethylcosane (PMI) were separated from any other peaks in all samples. The presence of PMI in recent and in ancient sediments has been used as a marker of methanogenic activity probably representing highly reducing conditions. Relative intensity of PMI in MH bearing zone was significantly lower at Kumano-nada than at other two locations. Several hopanols, which indicated bacterial activity, such as 17,21-bishomohopanol, 17,21-homohopanol and anhydrobacteriohopanetetrol were detected in all sediment samples. Similar distributions of hopanols were shown in samples at Tokai-oki and Daini-Atsumi knoll. Many different hopanols were detected in samples at Kumano-nada. These might reflect the differences of bacterial activity and depositional environment of each location.

This study was carried out as a part of the research undertaken by the Research Consortium for Methane Hydrate Researches in Japan (MH21).