

Products by radical reactions in methane hydrate

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Clathrate hydrate is a crystal compound of water molecules encaging guest molecules. Natural gas hydrate is found under deep ocean sea and in permafrost regions, and expected to be a future natural gas resource. Estimation of formation age in natural gas hydrate has been attempted using the ¹²⁹I method (e.g. Fehn et al., 2003), which is an indirect age determination method. In contrast, we have investigated to establish a direct age determination method from hydrate crystal itself. Since natural gas hydrate is formed in sediment and irradiated by natural radiation due to natural radioisotopes like ⁴⁰K, U-series and Th-series, chemical reaction via radicals may occur in natural samples. In methane hydrate, methyl radicals are induced by gamma-rays (Takeya et al., 2004). However, they are unstable at the natural condition of temperature and pressure, and dimerize to ethane (Ishikawa et al., 2007). In another reaction, methanol is also formed after gamma-ray irradiation to methane hydrate (Tani et al., 2008). In this study, we have investigated whether the other chemical products will be formed by gamma-irradiation in methane hydrate using GC-MS.

Keywords: methane hydrate, natural radiation, radical, methanol, gas chromatograph, dating