

Origin of natural gas hydrates and organic geochemistry of sediments of the gas hydrate reservoirs in site GMGS5-W08, the Qiongdongnan Basin (South China Sea)

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A large amount of natural gas hydrate has been discovered in the Qiongdongnan Basin (QDNB) during the fifth "China National Gas Hydrate Drilling Expedition" (GMGS5). On the basis of the geochemical investigation of the hydrate-related gases and hydrate-bearing sediments in well GMGS5-W08, this study identifies the source of gas hydrates and the organic geochemistry of the sediments within gas hydrate reservoirs. The hydrate-related gases consist of thermogenic gas and microbial gas^[1], and the proportion of biogenic gas in hydrate-related gas gradually decreases with the increase of buried depth. The characteristics of sediment samples are low TOC (mostly < 0.4%), S₁ (mostly < 0.1 mg HC/g rock), S₂ (mostly < 0.2 mg HC/g rock) and HI (mostly < 45 mg HC/g rock), indicating the hydrocarbon generation potential of silty clay sediments is poor. The extract in the hydrate-bearing sediments are composed of in situ organic matter and allochthonous organic matter. The in-situ sediments extract was immature terrigenous organic matters with high relative intensity of *n*C₃₁ significant odd-to-even preference, high carbon preference, and high abundance of C₂₉-C₃₁ ββ hopane. In addition, the allochthonous hydrocarbons originate from the deeply buried strata. The organic matter deposited in marine and transitional depositional environments with high abundance of C₂₃TT and C₂₄TeT. The range of calculated vitrinite reflectance (%R_c) is 0.77% to 0.86%, suggesting the allochthonous hydrocarbons are in mature stage. The primary microbial methane generated from the Yinggehai and Huangliu formation with the optimal temperature 35°C to 75°C. The thermogenic gas derived from L18 gas field.

References

[1] Milkov & Etiope (2018), Organic Geochemistry 125, 109-120