

Dynamisms and characteristics of dissolved organic matter (DOM) in deep aquifer: A scope for deep biosphere

*浦井 暖史^{1,2}、高野 淑識²、大河内 直彦²

*Atsushi Urai^{1,2}, Yoshinori Takano², Naohiko Ohkouchi²

1. 信州大学大学院総合医理工学研究科総合理工学専攻、2. 国立研究開発法人海洋研究開発機構生物地球化学研究分野

1. Department of Science and Technology, Graduate School of Medicine, Science and Technology, Shinshu University, 2. Department of Biogeochemistry, Japan Agency for Marine-Earth Science and Technology

Dissolved organic matter (DOM) is generally derived from multiple sources and affected by complicated transformation and degradation reactions. In a general geochemical description of marine environments, high-molecular-weight DOM (HMW-DOM; >1 kDa) particularly represents a unique organic carbon pool, which is accompanied by considerable difference in the molecular and stable isotopic compositions from other organic components such as particulate organic matter (POM) and low-molecular-weight DOM (LMW-DOM; <1 kDa) (e.g., Benner et al., 1997).

To date, formation of DOM fraction and potential microbial interaction in deep aquifer have been particularly poorly understood on the context of prokaryotic ecology. We investigated the molecular composition of DOM fraction including LMW and HMW by an improved method (Urai et al., 2018). The filtered samples are tentatively defined by conventional size scales; macromolecular scale (100 nm >> 40 nm), POM (40 nm >> 0.6 μm), HMW-DOM (0.6 μm >> 1 kDa), and total-DOM (<0.6 μm). We also have a validation to distinguish the molecular signature between phototrophic primary producers (i.e., fossil molecules) and presently living benthic prokaryotes (i.e., modern molecules; cf. biological methanogenesis, Kaneko et al., 2014). We report a preliminary result of the feasibility study and discuss a perspective from the view of deep biosphere.

References:

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