Paleoenvironmental reconstruction by organic matter analyses of Triassic-Jurassic highly mature sediments from North America and Inuyama, Japan.

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Paleoenvironmental reconstruction has been extensively performed using sedimentary organic matter, but paleoenvironmental and paleontological records were hardly preserved in ancient sediments that are of high maturity. In highly mature ancient sediments, a very small quantity of molecular fossils (biomarkers) in solvent extractable components (bitumen) and insoluble organic matter (kerogen, geomacromolecule) are possibly applicable as paleoenvironmental and paleoecological tools. The kerogen has been known to be well preserved as major organic component in ancient sediment. In the present study, we analyzed Triassic-Jurassic highly mature sediments from North America and Inuyama, Japan to improve biomarker and kerogen analyses for reconstructing paleoenvironments, and to examine variations of terrestrial and marine environments during the Triassic-Jurassic.

We used 1) lacustrine sediments (black shales and red sandstones) deposited during Triassic-Jurassic boundary from North America, and 2) Anisian to Toarcian (T-OAE2) pelagic sediments (black shales and cherts) of accretionary zone in Inuyama. Whole rock samples were crushed to a ‘rice’-sized (diameter 2–5 mm) grain in an agate mortar. Crushed rock samples (5–10 g) were extracted with ultrasonication, by successive treatment with organic solvents. Thereafter, residues were treated sequentially in a water bath shaker with HCl and HF. We analyzed pyrolysis and thermochemolysis of kerogen by using GC-MS equipped Curie-point pyrolyzer. Thermochemolysis was performed with tetramethylammonium hydroxide (TMAH).

Organic matter in sediments from both North America and Inuyama are confirmed to be of high maturity that were reached oil window. We identified β-carotane (lacustrine algae origin) and 2-methyl hopanes (marine cyanobacteria origin) in sediments from North America and Inuyama, respectively. Interestingly, phenol compounds released from kerogens are mainly detected in black shale from the East Berlin Formation in Hartford basin. These results suggest that terrestrial plant-derived materials were more efficiently transported and deposited by environmental change.

Keywords: Triassic-Jurassic boundary, biomarker, kerogen, termochemolysis, highly matured sediment

