

D/H of kerogen across the Permian/Triassic (P/Tr) boundary

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One of the most severe mass extinctions of Earth's history occurred near to the Permian/Triassic (P/Tr) boundary approximately 251 million years ago. Nearly 90% of all marine species and 70% of all terrestrial life became extinct (Benton & Twitchett, 2003). Several stable isotope excursions ($\delta^{13}\text{C}_{\text{biomarkers}}$, $\delta^{13}\text{C}_{\text{kerogen}}$, $\delta^{34}\text{S}_{\text{pyrite}}$) occur near this boundary and suggest a global disruption to carbon and sulfur cycles (e.g. Grice *et al.*, 2005).

Stable hydrogen isotope (δD) data from stratigraphic sequences of kerogen can provide information about changes in palaeoclimate if the kerogens are of comparable type and thermal maturity (e.g. Lis *et al.*, 2006). We present new δD data of stratigraphic series of kerogens from 3 different localities across the P/Tr boundary from Western Australia, East Greenland and Spitsbergen. The insoluble nature of kerogen guarantees that this material reflects in situ geochemical conditions. A dramatic change in δD of kerogen (35 ‰) is evident in several of the sections. The significance of this change along with δD of biomarkers will be discussed in terms of source/facies, paleoclimate and the extinction event.

The kerogen preparation method included demineralisation of solvent-extracted and decarbonated rock samples, heavy liquid separation, a second solvent extraction and final equilibration of the kerogen with isotopically heavy and light water vapours ahead of the on-line TC/EA measurements (Robl & Davis, 1993; Schimmelmann *et al.*, 1999).

References

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A field-scale study on *in situ* measurement of microbial activities below the sea floor, Ikeshima, Japan

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We employed the push-pull test (Istock *et al.*, Groundwater. 35(4), 619 (1997)) to determine the possibility of developing a measurement system for studying in situ microbial activities (organic matter degradation, iron and sulfate reducing activities, etc) that result in a change in groundwater geochemistry below the sea floor, Ikeshima, JAPAN. The test solution was prepared from ca. 3000 ml of groundwater with the addition of ca. 10 mmol/l KBr as a tracer, 10 mmol/l Na-lactate, and 10 mmol/l NaNO₃. The test solution was injected at a pressure of 0.6 MPa into a borehole ca. 130 m below sea surface level on the Ikeshima island, Japan. The borehole was 2-m deep and 86 mm in diameter, and the working volume was ca. 12000 ml. After the injection, the groundwater in the borehole was mixed with the test solution and extracted at a specified time. During extraction, the pH, redox potential (ORP vs Ag/AgCl), and dissolved oxygen (DO) were measured, and the concentrations of lactate, Br⁻, and NO₃⁻ were determined by an ion chromatogram. Prior to the injection of the test solution, the properties of the groundwater were as follows: pH, 7.8; ORP, -98 mV; DO, 0.6 mg/l; EC, 4.92 S/m; and 25.8°C. After 24 h, the concentrations of lactate and NO₃⁻ had decreased drastically, and DO had reduced slightly from 0.6 to 0.2 mg/l. These results reveal that there is a possibility of a microbial effect on the geochemistry of groundwater and the measurement of in situ microbial activities.