

**HYDROGEN EXCHANGE OF SATURATED HYDROCARBONS AND
ISOMERISATION/TRANSALKYLATION PROCESSES OF AROMATIC
HYDROCARBONS BASED ON $\delta^{13}\text{C}$ AND δD FROM THE UPPER DEVONIAN
DUVERNAY FORMATION (WESTERN CANADA)**

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Aromatic hydrocarbons are significant components of petroleum and sedimentary organic matter. Research on aromatic hydrocarbons in petroleum has been largely focused on molecular distributions particularly in relation to geosynthetic compounds (i.e. those not derived from natural products; e.g. Radke et al., 1982; van Aarssen et al., 1999). The present research aims to establish the distributions and stable carbon isotopic ($\delta^{13}\text{C}$) characteristics of individual aromatic hydrocarbons (alkylbenzenes, alkyl-naphthalenes, alkylphenanthrenes) in sediments and crude oils of varying age, facies type and maturity. The $\delta^{13}\text{C}$ of individual aromatic hydrocarbons analyzed by compound specific isotope analysis will be correlated with stable hydrogen isotopic compositions (δD) of saturated hydrocarbons (isoprenoids and *n*-alkanes; Dawson et al., 2005; 2006) in order to provide a global understanding of hydrogen exchange of saturated hydrocarbons and isomerisation/transalkylation processes of aromatic hydrocarbons associated with oil and gas generation. The source-rock sample set under investigation covers the full maturity range from immature to overmature levels in the Upper Devonian Duvernay Formation (organic-rich carbonate succession), one of the most prolific marine source rocks in Western Canada Sedimentary Basin (WCSB). In addition a selection of crude oils from WCSB is being investigated.

A detailed molecular and isotopic study of the biomarkers isorenieratane and crocetane in the Upper Devonian Duvernay Formation maturity sequence is also in progress. Previous work on the Upper Devonian Duvernay Formation has shown that aryl isoprenoids are attributed to isorenieratane and/or hypothetical Devonian carotenoids of photosynthetic green sulphur bacteria (Summons and Powell, 1986; Requejo et al., 1992; Hartgers et al., 1993; Koopmans et al., 1996; Grice et al., 1996). In addition, the biomarker crocetane identified in Devonian crude oils and source-rocks (Barber et al., 2001; Greenwood and Summons, 2003) is derived from anaerobic methane oxidisers (Thiel et al., 1999) or is a diagenetic product of carotenoids such as isorenieratane and/or hypothetical Devonian

carotenoid. A detailed biomarker and isotopic study of isorenieratane and crocetane covering a wide range of maturities in the Upper Duvernay Formation is also under investigation.

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