Re-Os pilot study of Western Australian oil

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Sampling and methods

Pilot Re-Os study on crude oil samples from Canning basin in Western Australia (WA) has been performed in order to test the suitability of Re-Os isotope system for geochronology and sources fingerprinting. The samples come from Dodonea, Sundown and Blina fields within Canning basin. The reservoir ages for these fields range from Ordovician to Carboniferous.

The asphaltene fraction was extracted from crude oil samples in order to pre-concentarte the Re and Os, and then these fractions were used for Re-Os chemistry as desribed in [1] using Carious tube tecnique, followed by N-TIMS analysis at Alberta University.

From twelve samples of WA oil studied, only three returned the results because of quite low Re-Os abundances in separated asphaltines, in a range of up to 1 ppb for rhenium and tens of ppt for osmium. This is quite low compare to Canadian oils, which usually show about an order of magnitude higher abundances of these metals. Higher Re and Os contents in Canadian oils correlate with markedly higher nickel and vanadium abundances [2].

Applications for geochronology and oil sources

Our preliminary data show a good fit with the basin ages using geologically reasonable initial Os ratios varying from depleted mantle-like ratio of 0.12 for Ordovician samples to the more evolved ratio of 0.4, corresponding to the Os isotopic composition of Late Devonian seawater [3]. Interestingly, the Ordovicial oil from Canning basin show more depleted source according to carbon isotope composition (~-31‰ $\delta^{13}C$) as well, trending towards more enriched marine compositions for Devonian-Carboniferous parts of the basin (-27 to -29 ‰ $\delta^{13}C$) [4]. As a conclusion, the study involving more samples shows a good potential for both geochronology and source fingerprinting of WA oils.

[1] Selby *et al* (2007) *GCA* **71**, 376-386. [2] Maslen (2010) *Curtin University PhD thesis*. [3] Turgeon *et al* (2007) *EPSL* **261**, 649-661. [4] Maslen *et al* (2011) *Org Geochem* **42**, 387-398.