

GEOCHEMICAL CORRELATION OF PYROBITUMEN-FILLS WITH HOST MID-CRETACEOUS BLACK FLYSCH GROUP (BASQUE-CANTABRIAN BASIN, WEST PYRENEES)

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The occurrence of solid bitumen-fills within and postdated by syntectonic Albian deposits of the Black Flysch Group (Basque-Cantabrian Basin, west Pyrenees) records the syndepositional venting of petroleum due to local tectonic compression (Agirrezabala et al., 2002; Agirrezabala, in prep.). Traditionally, two main source-rocks have been proposed for commercial petroleum and gas of the Basque-Cantabrian Basin, i.e. Jurassic black-shales (Quesada et al.1997) and Carboniferous coals (Martínez del Olmo and Mallo, 2002). However, comparison of geochemical features of the studied Albian solid bitumens with samples of Jurassic and Carboniferous source-rocks and derived petroleum (Jurassic, Ayoluengo field) and gas condensate (Carboniferous, Gaviota field) as well as with host deposits indicates a good correlation of the solid bitumen-fills with the Black Flysch Group.

The Albian-Cenomanian Black Flysch Group consists of organic-rich (background TOC about 1% wt.), deep-water siliciclastic turbidites deposited in small, confined sub-basins along the transcurrent northern margin of the Basque-Cantabrian Basin and the Pyrenean realm. Locally, authigenic carbonates formed by anaerobic oxidation of vented hydrocarbon-rich fluids adjacent to synsedimentary faults. These carbonate deposits are rich in organics (TOC up to 3.6% wt.) and exhibit voids filled of solid bitumen and oil-impregnations analysed herein.

The solid bitumen samples show very low solubility, non-fluorescence with epifluorescence microscopy (UV), high T_{max} (482-563°C), and very low HI and OI (10-13 and 5-13, respectively) indicative of overmature pyrobitumen (probably impsonite).

The analysed pyrobitumen and oil-impregnations exhibit a mean $\delta^{13}C_{org}$ isotopic composition of -25.28‰ (from -24.27‰ to -26.33‰), very similar to the mean value of -25.02‰ (from -24.73‰ to -25.43‰) of the host Black Flysch Group. These values coincide with Albian terrestrial organic matter values from North Atlantic Ocean (Hofmann et al., 2000). In contrast, the Jurassic source-rock and derived petroleum exhibit more depleted ^{13}C values (-29.93‰ and -29.88‰, respectively; Quesada et al., 1997) whereas the Carboniferous

coal and derived gas condensate show more enriched ^{13}C values ($\sim -23\text{‰}$ and -23.26‰ , respectively).

The $\delta^{13}\text{C}$ values of saturated and aromatic hydrocarbon fractions are plotted in the Figure 1. Carbon isotopic values of the pyrobitumen samples and Black Flysch deposits are similar with slightly more depleted $^{13}\text{C}_{\text{aro}}$ value for the latter. In contrast, the Jurassic source-rock shows high depletion of $^{13}\text{C}_{\text{aro}}$ and the Carboniferous gas condensate enrichment of $^{13}\text{C}_{\text{sat}}$ with respect to the pyrobitumen values.

In other wise, gas chromatograms of the aliphatic hydrocarbon fractions from pyrobitumen and Black Flysch samples show both similar bimodal distribution of *n*-alkanes and even-carbon preference (Chaler et al., 2005).

In summary, good geochemical correlation indicates that the Black Flysch Group constitutes the source-rock of the studied pyrobitumen-fills.

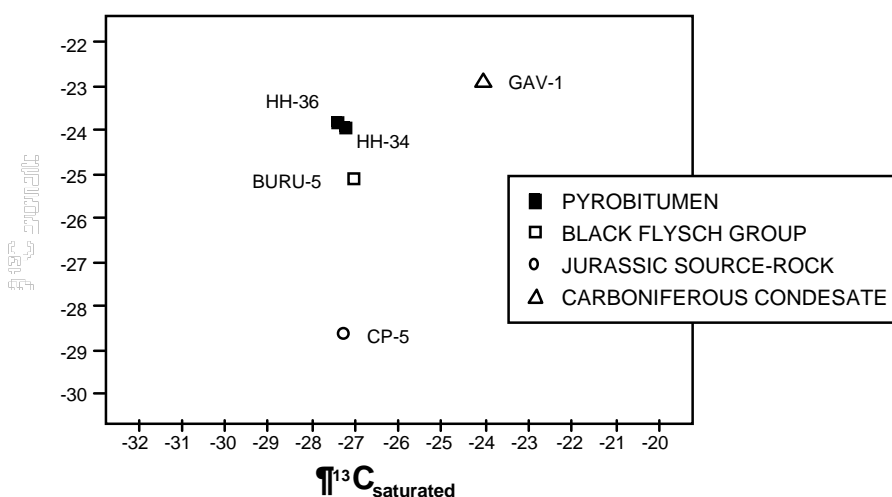


Figure 1. Cross-plot of carbon isotopic ratios of saturated and aromatic fractions.

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