

# Neo-pentane in gas–gas correlation

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Gas–gas correlations are routinely based on the isotopic (carbon and hydrogen) composition of individual gaseous hydrocarbons from methane to *n*-pentane ( $C_1$ – $C_5$ ). However, biodegradation can so alter the isotopic composition of the gaseous hydrocarbons that source and maturity information is no longer discernable. Here we report the carbon isotopic composition of 2,2-dimethylpropane (*neo*-pentane or *neo*- $C_5$ ) in Australian natural gases derived from source rocks of Late Proterozoic to Early Tertiary age. The  $\delta^{13}C$  *neo*- $C_5$  shows a strong source control and, by comparison, the carbon isotopic effects of maturity are very small. Furthermore, *neo*- $C_5$  is very resistant to biodegradation.

Non-biodegraded Australian natural gases show *neo*- $C_5$ / $\Sigma C_5$  ratios up to 0.05. In severely biodegraded natural gases, *neo*- $C_5$  can become the most abundant  $C_5$  isomer with *neo*- $C_5$ / $\Sigma C_5$  ratios up to 0.9. The  $\delta^{13}C$  *neo*-pentane is identical to that for non-biodegraded natural gas from the same source (Fig. 1), providing strong evidence that *neo*-pentane is biodegradation tolerant even within severely biodegraded gases. The carbon isotopic composition of *neo*-pentane ranges from -50.8 to -27.1‰ and is invariably isotopically lighter than *iso*- $C_5$  and *n*- $C_5$  (Fig. 1) with  $\Delta^{13}C$  *neo*- $C_5$  – *i*- $C_5$  between -1.8 and -8.3‰ for non-biodegraded gases; in biodegraded gases the *iso*- $C_5$  and *n*- $C_5$  become progressively enriched in  $^{13}C$ , resulting in much larger isotopic differences (Fig. 1). The data also highlights the specific to diverse microbial communities that act in the deep subsurface. Barrow Island gas shows a more propane-specific (very enriched in  $^{13}C$ ) response whereas in Enfield there is a much earlier biotilization of the other hydrocarbon gases.

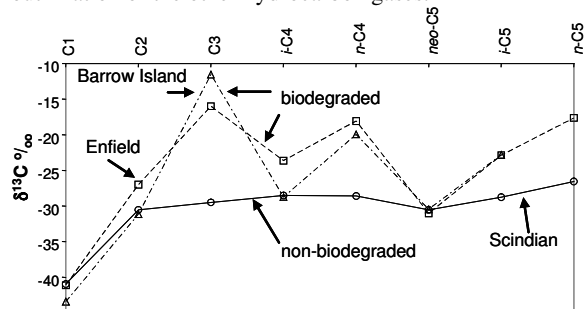


Figure 1. Carbon isotopic composition for  $C_1$ – $C_5$  hydrocarbons from natural gases of the Carnarvon Basin, Western Australia