

## Neopentane: a new proxy for a better assessment of petroleum systems

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During the last decades, the sensitivity and selectivity of both chemical and isotopic analyses of gas compounds increased drastically, thanks to technological improvements on separation and detection. Today, neopentane, which was considered naturally inexistent in past studies, is evidenced in natural systems, even if its concentrations are always in the range of tens to hundreds of ppm.

The very specific molecular structure of this compound (one carbon saturated with 4 other carbon atoms) induces a very high chemical stability, for both thermal and biological processes. Also, its physical properties are quite distinctive of the other butane and pentane isomers.

We present recent geological applications demonstrating the interest of this new proxy:

- Thermal maturity of gases may be quantitatively estimated through the increase of neopentane proportions, this compound being far more resistant to late cracking than other gas compounds. This is particularly valuable for high maturity fluids, where the usual hydrocarbon compounds used for maturity assessment are totally cracked;
- For surface geochemistry exploration, the presence of neopentane in soils indicates directly deep thermogenic gas seeps, easily distinguishable from a superficial biological background that seems not to contain any measurable neopentane;
- During drilling processes, its almost inert behavior allows to use it as an internal standard for gas-logging, correcting any bit metamorphism or bacterial artefact from the natural gas signal;
- Biodegradation and water washing will induce large fractionations between this compound and its C<sub>4</sub>-C<sub>5</sub> homologs, allowing a quantification of those processes;
- In deep offshore environment or polar areas, the presence of gas hydrates will severely fractionate the pentane isomers, as neopentane is not as keen for entering hydrate structures. This will result in higher concentrations of neopentane compared to other isomers.