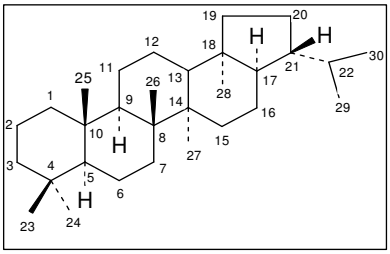
C30 Hopanes

Occurrence and origin:

Beside Norhopanes (C29, see BMF 7) C30 hopanes are the most common hopanes of **sedimentary matter**. The origin of the hopanes is the most abundant hopanoid in prokaryotes, C35 tetrahydroxybacteriohopane.



Cat. No. 0132.30
17α(H),21β(H)-Hopane
(30αβ)

Geochemical relevance and use in oil spill analysis

Hopanes play an important role in **geochemical investigations**, and are diagnostic biomarker indicators and useful as proof of the origin in **oil spill analysis**, **oil waste analysis** and **analysis of airborne particulates.** They contribute to the so-called terpane fingerprint and are commonly used to relate oils with source rocks.

There are **4 common isomers** of C30-hopanes. The most common are isomers with variable stereochemistry at the 17 and 21 positions, either β(H) with hydrogen above the plane or α-(H) with the hydrogen below the plane.

The **natural isomer ββ** (17β(H),21β(H)) may be **found in recent sediments**. However, the **αβ-isomer** is always the **dominant in mature sediments**, while smaller amounts of the βα- isomer are present. Only minor quantities of the less stable αα-isomer are present. Thus, the ββ- and the αα-isomers are useful internal standards as they normally do not co-elute with other hopanes or triterpenoids in mature sediment.

The βα-isomers (moretanes) are highly specific for **immature to early oil generation**. The moretanes are thermally less stable than the αβ-hopanes, and abundances of the C29 and C30 moretanes decrease relatively to the corresponding hopanes with thermal maturity. The ratio of βα-moretanes to their corresponding αβ-hopanes decrease with thermal maturity from ca. 0,8 to <0,15. The moretane/hopane ratio is used most commonly for C30, but it is also quantified using C29.

In **fresh oil spills**, the **αβ-isomer** of hopane is considered to be non-biodegradable and conserved. Consequently, it can be used as an internal standard to monitor the amount of total oil removed by bioremediation (treatment by oil-degrading bacteria).

The hopanes elute on a normal nonpolar GC-column in the order; αβ-, βα-, αα-, ββ. The C30 gammacerane (Cat. No. 2646.30) elutes late and in the region **between** the **C31 22R (1339.31) and C32 22S (1338.31) isomers** while the oleanane isomers (α and β, Cat. No. **0617.30** and **0618.30**) co-elutes with lupane between βα29 and αβ30.

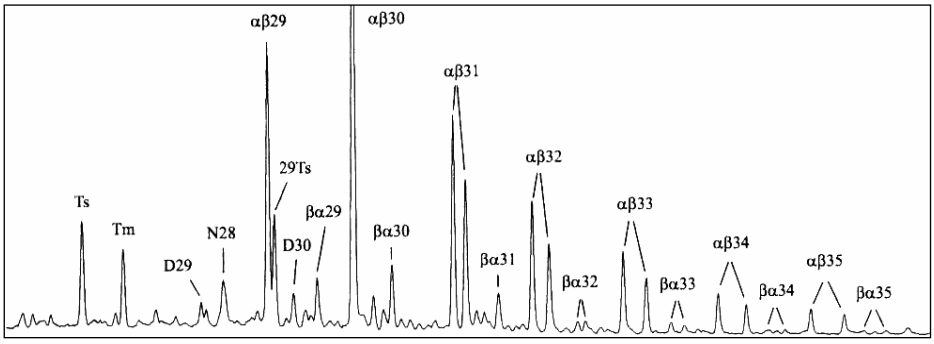


Figure: GC-MS of Mona-2 Oil, Danish North Sea
(Courtesy of Peter Nytoft, GEUS, Denmark)

Regular C30 Hopanes available from Chiron:

- 5-10 µg neat are supplied in convenient 300µL GC-vials for dilution to e.g. 50-100µg/mL
- 50 and 100 µg/mL are supplied in isooctane (1 mL ampoules)
- Quantities are measured relative to the intensity (TIC) of 30αβ hopane or by gravimetry

2888.30-50-IO	17α(H),21α(H)-Hopane	50 µg/ml
0132.30-100-IO	17α(H),21β(H)-Hopane	100 µg/ml
0612.30-100-IO	17β(H),21α(H)-Hopane (moretane)	100 µg/ml
0613.30-100-IO	17β(H),21β(H)-Hopane (hopane)	100 µg/ml

Other C30 Hopanes

2179.30-50-IO	17α(H),21α(H)-30-Nor-29-methylhopane	50 µg/ml
2262.30-50-IO	17α(H),21β(H)-30-Nor-29-methylhopane	50 µg/ml
2886.30-5UG	17α(H)-30-Diahopane (D30)	ca. 5 µg neat
2884.30-5UG	17β(H),21α(H)-22-Methyl-28-nor-spergulane	ca. 5 µg neat
9958.30-5UG	8α,9β,10α(H),14β(H),17α(H),21β(H)-5,9-Dimethyl-25,27-bisnorhopane	ca. 5 µg neat
9960.30-5UG	5β(H)-17α(H),21β(H)-Hopane (mix. with 0132.30)	ca. 5 µg neat

Other C30 Triterpanes

2646.30-10UG	Gammacerane	ca. 10 µg neat
0617.30-100-IO	18α(H)-Oleanane	100 µg/ml
0618.30-100-IO	18β(H)-Oleanane	100 µg/ml
0619.30-100-IO	Friedelane (91%)	100 µg/ml
0616.30-100-IO	Lupane	100 µg/ml
0620.30-100-IO	Onocerane I (84%)	100 µg/ml
0621.30-100-IO	Onocerane II (13% in mix. With Onocerane I)	100 µg/ml
1192.30-100-IO	20R/20S-Dammarane	100 µg/ml

Bicadinanes

9953.30-10UG	Bicadinane W	ca. 10 µg neat
9952.30-50-IO	Bicadinane T	50 µg/ml
9951.30-10UG	Bicadinane R	ca. 10 µg neat
9954.30-10UG	Bicadinane MeT	ca. 10 µg neat

Olenanane degradation products: All ca. 5 µg neat

8792.30-5UG	C30 Pentacyclic triterpane I (or X); 2,2,5-Trimethyl-A'-neo-23,24,25-trinorgammacerane
8793.30-5UG	C30 Pentacyclic triterpane II (or Y); 3,5-Dimethyl-(3α-4β,5β,18α)-24,25-dinoroleanane
8794.30-5UG	C30 Pentacyclic triterpane III (or Z); Ring A spiro oleanane; Methyl-3β,4α,10α,18α)-1,5-cyclo-24-nor-1,10-seco-oleanane
8795.30-5UG	Seco-18α(H)-oleanane B2; 17,18-trans-8,14-seco-oleanane
8796.30-5UG	Seco-18β(H)-oleanane A2-2; 17,18-cis-8,14-seco-oleanane
8797.30-5UG	Seco-oleanane A2-1

Other relevant Biomarker Focuses:

Norhopanes: Biomarker Focus 7
Rearranged hopanes: Biomarker Focus 35
2-Methyl and 3-Methylhopanes: Biomarker Focus 37
Homohopanes and gammacerane: Biomarker Focus 38

References:

1. K.E.Peters, C.C. Walters and J.M. Moldowan, The biomarker guide, 2. ed. Vol. 1&2, Cambridge University Press, Cambridge 2005.
2. Daling, Faksness, Hansen, and Stout, *Environmental Forensics*, 2002; **3**, 263.
3. cf: http://www.nordicinnovation.net/nordtestfiler/tec498.pdf .
4. Wang and Fingas, *Marine Pollution Bulletin*, 2003; **47**, 423, and references therein.
5. Nytoft and Bojesen-Koefoed, *Organic Geochemistry*, 2001; **32**, 841.
6. J.R. Brook *et.al., Atmospheric environment*, 2007; **41**, 119-135.