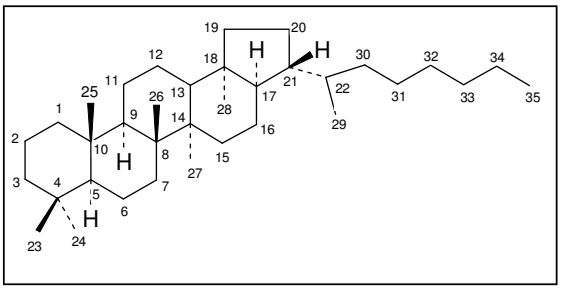
Homohopanes and Gammacerane

C31 to C35 homohopanes and pentacyclic triterpanes like gammacerane are constituents of sedimentary organic matter. The origin of the homohopanes is the most abundant hopanoid in prokaryotes, C35 tetrahydroxybacteriohopane.

The only known precursor of gammacerane is tetrahymanol. Tetrahymanol originates from protozoa[1] and has been associated with ciliates that feed on anaerobic bacteria.

Chiron now offers an authentic gammacerane standard in addition to the C31 homohopanes for a safe identification. Gammacerane has a completely different MS than the C31 homohopanes and reference spectra obtained from the standards are useful for this reason.

See page 4 for homohopanes and triterpanes available from Chiron.
- µg quantities are supplied in convenient 300µL GC-vials for dilution (qualitative analysis)
- 50 and 100 µg are supplied in isooctane (1 mL vials)
- Quantities are measured relative to the intensity (TIC) of 30αβ hopane or by gravimetry



C35-Homohopane including typical numbering

Geochemical relevance and use in oil spill analysis

Homohopanes play an important role in geochemical investigations,[2] and are diagnostic biomarker indicators and useful as proof of the origin in oil spill analysis[3-4], oil waste analysis and analysis of airborne particulates.

Gammacerane has frequently been associated with hypersaline lacustrine environments and gammacerane structures were shown to be reliable geochemical indicators for water column stratification in marine deposits.[5] Gammacerane is one of several diagnostic biomarkers useful in oil spill analysis.[3-4]

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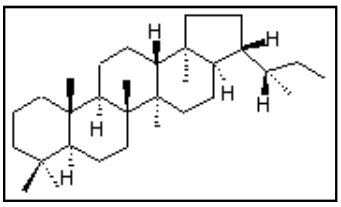
Methods of analysis

Homohopanes



Cat. No. 1339.31
17α(H),21β(H)-(22R)-Homohopane (31αβ22R)

There are 8 possible isomers of each homohopane C31 to C35. The natural ββ isomers (17β(H),21β(H)) may be found in recent sediments. However, the αβ-isomers are always the dominant in mature sediments, while smaller amounts of βα- isomers are present. Only minor quantities of the less stable αα-isomers are present.

The homohopanes elute as pairs of 22S- and 22R-isomers, where the 22S-isomer normally elutes first. An exception is the βα-C31 where the 22S- and 22R-isomers coelutes.[6] The elution order is complicated because the ββ-isomers elute late. For instance for the C31 hopanes, the αβ-C32 isomers will elute before the ββ-C31 isomers. The C30 Gammacerane and some other minor hopanoids elutes in the region between the C31 22R and C32 22S isomers.

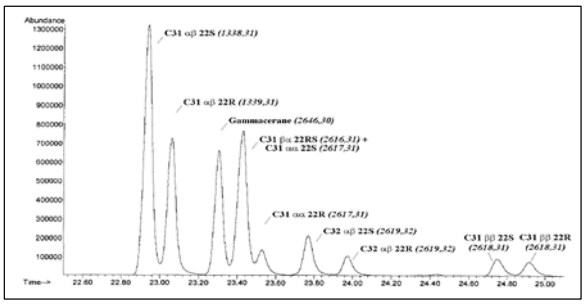


Figure 1:
GC-MS of a mixture of the synthetic C31 homohopane isomers spiked with gammacerane and C32 αβ bishomohopane

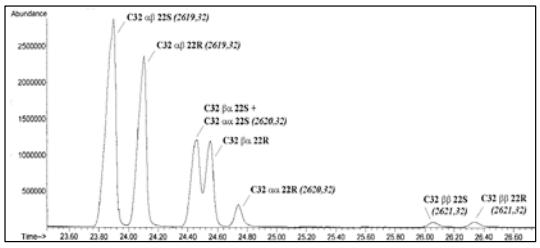


Figure 2:
GC-MS of a synthetic C32 bishomohopane isomer mixture (Cat No. 2350.32)

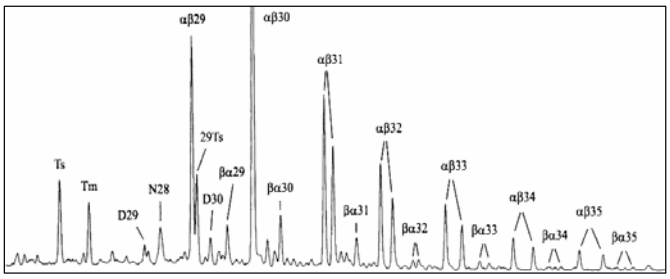


Figure 3:
GC-MS of Mona-2 Oil, Danish North Sea (Courtesy of Peter Nytoft, GEUS, Denmark)

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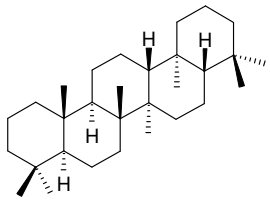
Gammacerane



Cat. No. 2646.30
Gammacerane

Gammacerane elutes from the gas chromatograph behind C31 αβ 22R homohopane (αβ31 22R) and just in front of C31 βα 22R+S homohopanes (βα31), thus making the detection of gammacerane rather difficult. Several laboratories have misidentified gammacerane for this reason.[3]

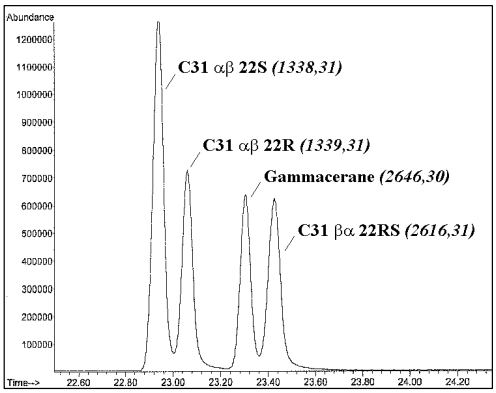


Figure 4:
GC-MS of a mixture of synthetic gammacerane and αβ31 and βα31 isomers.

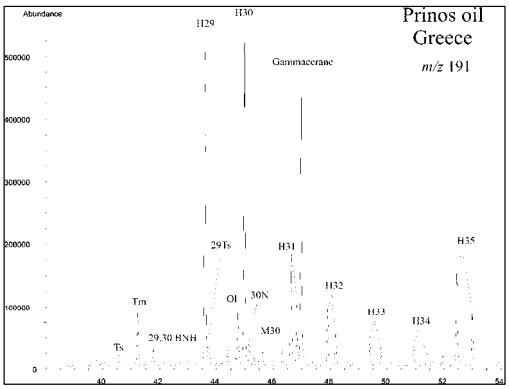


Figure 5:
GC-MS of Prinos oil, Greece
(Courtesy of Peter Nytoft, GEUS, Denmark)

References:
1. Mallory et al. J. Am. Chem. Soc., 1963; 85, 1362
2. Peters, Walters and Moldowan, The Biomarker Guide, Cambrigde University Press, Cambridge, 2005
3. Daling, Faksness, Hansen, and Stout, Environmental Forensics, 2002; 3, 263
   cf: http://www.nordicinnovation.net/nordtestfiler/tec498.pdf
4. Wang and Fingas, Marine Pollution Bulletin, 2003; 47, 423, and references therein
5. Sinninghe Damste et al. Geochem. Cosmochim. Acta., 1995; 59, 1985
6. Nytoft and Bojesen-Koefoed, Organic Geochemistry, 2001; 32, 841

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Available from Chiron:

C31 Hopanes (Homohopanes)

2617.31-10UG	17α(H),21α(H)-22RS-Homohopane	31αα 22RS	ca. 10 µg neat
1339.31-50-IO	17α(H),21β(H)-22R-Homohopane	31αβ 22R	50 µg/mL, 1x1 mL in isooctane (purity 91%)
1338.31-50-IO	17α(H),21β(H)-22S-Homohopane	31αβ 22S	50 µg/mL, 1x1 mL in isooctane
2255.31-10UG	17α(H),21β(H)-22RS-Homohopane	31αβ 22RS	ca. 10 µg neat
2616.31-10UG	17β(H),21α(H)-22RS-Homohopane	31βα 22RS	ca. 10 µg neat
2618.31-10UG	17β(H),21β(H)-22RS-Homohopane	31ββ 22RS	ca. 10 µg neat

C32 Hopanes (Bishomohopanes)

2620.32-10UG	17α(H),21α(H)-22RS-Bishomohopane	32αα 22RS	ca. 10 µg neat (purity 70%)
2619.32-10UG	17α(H),21β(H)-22RS-Bishomohopane	32αβ 22RS	ca. 10 µg neat
3603.32-5UG	17β(H),21α (H)-22RS-Bishomohopane	32βα 22RS	ca. 5 µg neat
2350.32-100-IO	Bishomohopane, Isomer mix (17α(H),21β(H)-22RS as main compounds)		100 µg/mL, 1x1 mL in isooctane

C33 Hopanes (Trishomohopanes)

2623.33-10UG	17α(H),21α(H)-22RS-Trishomohopane	33αα 22RS	ca. 10 µg neat (purity 80%)
2622.33-10UG	17α(H),21β(H)-22RS-Trishomohopane	33αβ 22RS	ca. 10 µg neat
2624.33-10UG	17β(H),21β(H)-22RS-Trishomohopane	33ββ 22RS	ca. 10 µg neat (purity 59%)

C34 Hopanes (Tetrakishomohopanes)

2689.34-10UG	17α(H),21β(H)-22R-Tetrakishomohopane	34αβ 22R	ca. 10 µg neat
2688.34-10UG	17α(H),21β(H)-22S-Tetrakishomohopane	34αβ 22S	ca. 10 µg neat
2625.34-10UG	17α(H),21β(H)-22RS-Tetrakishomohopane	34αβ 22RS	ca. 10 µg neat
2691.34-10UG	17β(H),21α(H)-22R-Tetrakishomohopane	34βα 22R	ca. 10 µg neat (purity 94%)
2690.34-5UG	17β(H),21α(H)-22S-Tetrakishomohopane	34βα 22S	ca. 5 µg neat (purity 94%)

C35 Hopanes (Pentakishomohopanes)

2628.35-10UG	17α(H),21β(H)-22RS-Pentakishomohopane	35αβ 22RS	ca. 10 µg neat
2629.35-50-IO	17β(H),21α(H)-22RS-Pentakishomohopane	35βα 22RS	50 µg/mL, 1x1 mL in isooctane
2629.35-10UG	17β(H),21α(H)-22RS-Pentakishomohopane	35βα 22RS	ca. 10 µg neat

C30 Hopanes and triterpanes

2888.30-50-IO	17α(H),21α(H)-Hopane	30αα	50 µg/mL, 1x1 mL in isooctane
0132.30-100-IO	17α(H),21β(H)-Hopane	30αβ	100 µg/mL, 1x1 mL in isooctane
0612.30-100-IO	17β(H),21α(H)-Hopane (moretane)	30βα	100 µg/mL, 1x1 mL in isooctane
0613.30-100-IO	17β(H),21β(H)-Hopane (hopane)	30ββ	100 µg/mL, 1x1 mL in isooctane
2179.30-50-IO	17α(H),21α(H)-30-Nor-29-methylhopane		50 µg/mL, 1x1 mL in isooctane
2262.30-50-IO	17α(H),21β(H)-30-Nor-29-methylhopane		50 µg/mL, 1x1 mL in isooctane
2886.30-5UG	17α(H)-30-Diahopane	30D	ca. 5 µg neat
2884.30-5UG	17β(H),21α(H)-22-Methyl-28-*nor*-spergulane		ca. 5 µg neat
0617.30-100-IO	18α(H)-Oleanane	18αO	100 µg/mL, 1x1 mL in isooctane
0618.30-100-IO	18β(H)-Oleanane	18βO	100 µg/mL, 1x1 mL in isooctane
0619.30-100-IO	Friedelane (91%)		100 µg/mL, 1x1 mL in isooctane
0616.30-100-IO	Lupane		100 µg/mL, 1x1 mL in isooctane
0620.30-100-IO	Onocerane I (8β(H),14α(H)), 84%		100 µg/mL, 1x1 mL in isooctane
0621.30-100-IO	Onocerane II (8β(H),14α(H)), 13% in a mix. with Onocerane I		100 µg/mL, 1x1 mL in isooctane
1192.30-100-IO	20R/20S-Dammarane (50/50)		100 µg/mL, 1x1 mL in isooctane
9958.30-5UG	8α,9β,10α(H),14β(H),17α(H),21β(H)-5,9-Dimethyl-25,27-bisnorhopane		ca. 5 µg neat (please inquire)
9960.30-5UG	5β(H),17α(H),21β(H)-Hopane (mix. with 0132.30)		ca. 5 µg neat (please inquire)

Gammacerane

2646.30-10UG	Gammacerane	G	ca. 10 µg neat

Other relevant Biomarker Foci:
Norhopanes: Biomarker Focus 7

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