



## Homohopanes and Gammacerane



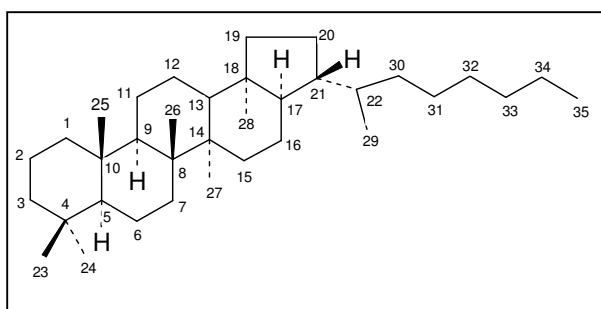
**C31 to C35 homohopanes and pentacyclic triterpanes like gammacerane are constituents of sedimentary organic matter. The origin of the homohopanes is the most abundant hopanoid in prokaryotes, C35 tetrahydrobacteriohopane.**

The only known precursor of gammacerane is tetrahymanol. Tetrahymanol originates from protozoa<sup>1</sup> 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 µg/mL and 100 µg/mL are supplied in isoctane (1 mL vials)
- Quantities are measured relative to the intensity (TIC) of 30αβ hopane or by gravimetry



C35-Homohopane including typical numbering

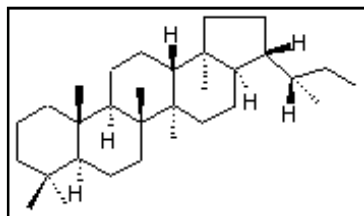
### Geochemical relevance and use in oil spill analysis

Homohopanes play an important role in geochemical investigations,<sup>2</sup> and are diagnostic biomarker indicators and useful as proof of the origin in oil spill analysis<sup>3-4</sup>, 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.<sup>5</sup> Gammacerane is one of several diagnostic biomarkers useful in oil spill analysis.<sup>3-4</sup>

## Methods of analysis

### Homohopanes



Cat. No. 1339.31  
17 $\alpha$ (H),21 $\beta$ (H)-(22R)-Homohopane (31 $\alpha\beta$ 22R)

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

The homohopanes elute as pairs of 22S- and 22R-isomers, where the 22S-isomer normally elutes first. An exception is the  $\beta\alpha$ -C31 where the 22S- and 22R-isomers coelutes.<sup>6</sup> The elution order is complicated because the  $\beta\beta$ -isomers elute late. For instance for the C31 hopanes, the  $\alpha\beta$ -C32 isomers will elute before the  $\beta\beta$ -C31 isomers. The C30 Gammacerane and some other minor hopanoids elutes in the region between the C31 22R and C32 22S isomers.

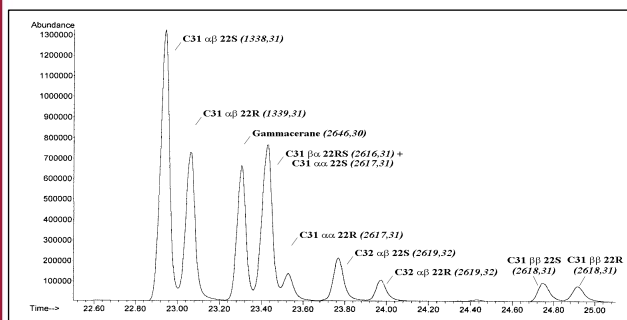


Figure 1:  
GC-MS of a mixture of the synthetic C31 homohopane isomers spiked with gammacerane and C32  $\alpha\beta$  bishomohopane

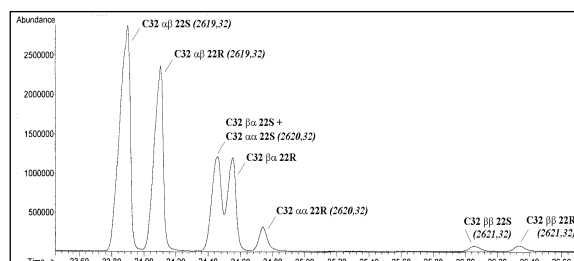


Figure 2:  
GC-MS of a synthetic C32 bishomohopane isomer mixture (Cat No. 2350.32)

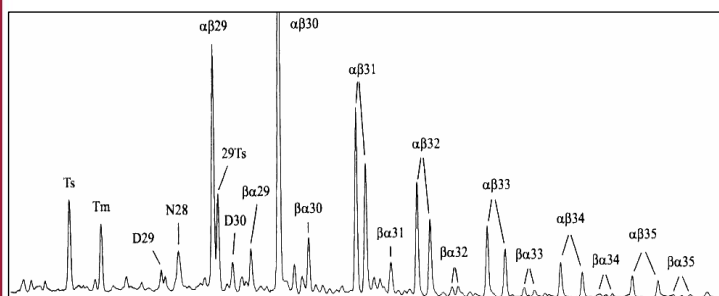
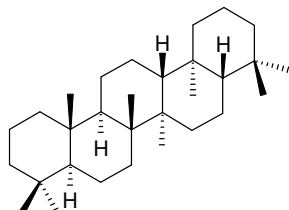


Figure 3:  
GC-MS of Mona-2 Oil, Danish North Sea  
(Courtesy of Peter Nytoft, GEUS, Denmark)



## Gammacerane



Cat. No. 2646.30  
Gammacerane

Gammacerane elutes from the gas chromatograph behind C31  $\alpha\beta$  22R homohopane ( $\alpha\beta$ 31 22R) and just in front of C31  $\beta\alpha$  22R+S homohopanes ( $\beta\alpha$ 31), thus making the detection of gammacerane rather difficult. Several laboratories have misidentified gammacerane for this reason.<sup>3</sup>

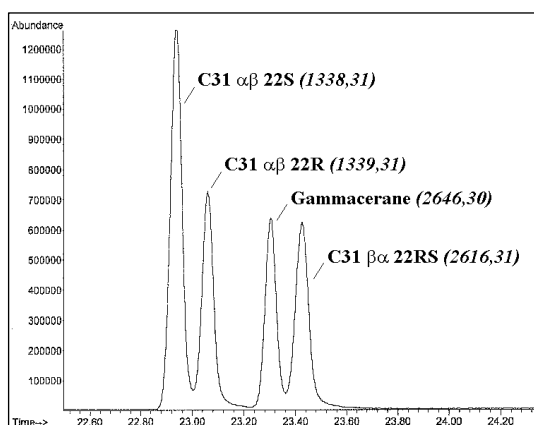


Figure 4:  
GC-MS of a mixture of synthetic gammacerane and  $\alpha\beta$ 31 and  $\beta\alpha$ 31 isomers.

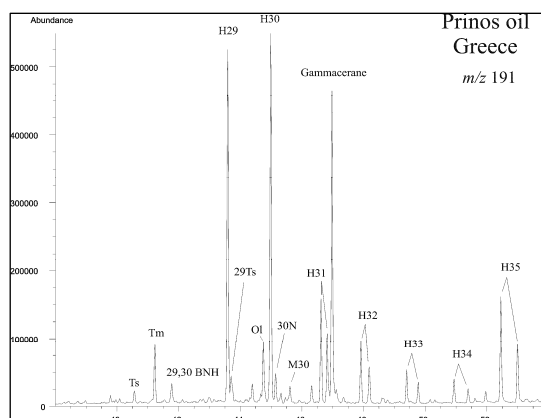


Figure 5:  
GC-MS of Prinos oil, Greece  
(Courtesy of Peter Nytoft, GEUS, Denmark)

### References:

1. Mallory et al. J. Am. Chem. Soc., 1963; 85, 1362
2. Peters, Walters and Moldowan, The Biomarker Guide, Cambridge 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

## Available from Chiron:

**C31 Hopanes (Homohopanes)**

2617.31-10UG	17 $\alpha$ (H),21 $\alpha$ (H)-22RS-Homohopane	31 $\alpha\alpha$ 22RS	ca. 10 $\mu$ g neat (purity 89%)
1339.31-50-IO	17 $\alpha$ (H),21 $\beta$ (H)-22R-Homohopane	31 $\alpha\beta$ 22R	50 $\mu$ g/mL, 1x1 mL in isoootane (purity 91%)
1338.31-50-IO	17 $\alpha$ (H),21 $\beta$ (H)-22S-Homohopane	31 $\alpha\beta$ 22S	50 $\mu$ g/mL, 1x1 mL in isoootane
2255.31-10UG	17 $\alpha$ (H),21 $\beta$ (H)-22RS-Homohopane	31 $\alpha\beta$ 22RS	ca. 10 $\mu$ g neat
2616.31-10UG	17 $\beta$ (H),21 $\alpha$ (H)-22RS-Homohopane	31 $\beta\alpha$ 22RS	ca. 10 $\mu$ g neat
2618.31-10UG	17 $\beta$ (H),21 $\beta$ (H)-22RS-Homohopane	31 $\beta\beta$ 22RS	ca. 10 $\mu$ g neat (purity 91%)

**C32 Hopanes (Bishomohopanes)**

2620.32-10UG	17 $\alpha$ (H),21 $\alpha$ (H)-22RS-Bishomohopane	32 $\alpha\alpha$ 22RS	ca. 10 $\mu$ g neat (purity 70%)
2619.32-10UG	17 $\alpha$ (H),21 $\beta$ (H)-22RS-Bishomohopane	32 $\alpha\beta$ 22RS	ca. 10 $\mu$ g neat
3603.32-5UG	17 $\beta$ (H),21 $\alpha$ (H)-22RS-Bishomohopane	32 $\beta\alpha$ 22RS	ca. 5 $\mu$ g neat
2350.32-100-IO	Bishomohopane, Isomer mix (17 $\alpha$ (H),21 $\beta$ (H)-22RS as main compounds)		100 $\mu$ g/mL, 1x1 mL in isoootane

**C33 Hopanes (Trishomohopanes)**

2623.33-10UG	17 $\alpha$ (H),21 $\alpha$ (H)-22RS-Trishomohopane	33 $\alpha\alpha$ 22RS	ca. 10 $\mu$ g neat (purity 80%)
2622.33-10UG	17 $\alpha$ (H),21 $\beta$ (H)-22RS-Trishomohopane	33 $\alpha\beta$ 22RS	ca. 10 $\mu$ g neat
2624.33-10UG	17 $\beta$ (H),21 $\beta$ (H)-22RS-Trishomohopane	33 $\beta\beta$ 22RS	ca. 10 $\mu$ g neat (purity 59%)

**C34 Hopanes (Tetrakishomohopanes)**

2689.34-10UG	17 $\alpha$ (H),21 $\beta$ (H)-22R-Tetrakishomohopane	34 $\alpha\beta$ 22R	ca. 10 $\mu$ g neat
2688.34-10UG	17 $\alpha$ (H),21 $\beta$ (H)-22S-Tetrakishomohopane	34 $\alpha\beta$ 22S	ca. 10 $\mu$ g neat
2625.34-10UG	17 $\alpha$ (H),21 $\beta$ (H)-22RS-Tetrakishomohopane	34 $\alpha\beta$ 22RS	ca. 10 $\mu$ g neat
2691.34-10UG	17 $\beta$ (H),21 $\alpha$ (H)-22R-Tetrakishomohopane	34 $\beta\alpha$ 22R	ca. 10 $\mu$ g neat (purity 94%)
2690.34-5UG	17 $\beta$ (H),21 $\alpha$ (H)-22S-Tetrakishomohopane	34 $\beta\alpha$ 22S	ca. 5 $\mu$ g neat (purity 94%)

**C35 Hopanes (Pentakishomohopanes)**

2628.35-10UG	17 $\alpha$ (H),21 $\beta$ (H)-22RS-Pentakishomohopane	35 $\alpha\beta$ 22RS	ca. 10 $\mu$ g neat
2629.35-50-IO	17 $\beta$ (H),21 $\alpha$ (H)-22RS-Pentakishomohopane	35 $\beta\alpha$ 22RS	50 $\mu$ g/mL, 1x1 mL in isoootane
2629.35-10UG	17 $\beta$ (H),21 $\alpha$ (H)-22RS-Pentakishomohopane	35 $\beta\alpha$ 22RS	ca. 10 $\mu$ g neat

**C30 Hopanes and triterpanes**

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

**Gammacerane**

2646.30-10UG	Gammacerane	G	ca. 10 $\mu$ g neat
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**Other relevant Biomarker Foci:**

**Norhopanes:** Biomarker Focus 7

