

## BIOMOLECULES PRESERVED IN MIDDLE JURASSIC FOSSIL CONIFER WOOD

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The oldest polar terpenoids are known from Cretaceous resinites (Alonso *et al.* 2000) and a few Cretaceous gymnosperm remains, such as *Sphenolepis* (Otto *et al.* 1999) and *Tritaenia* (Otto *et al.* 2002b). In all these cases only minor amounts of ferruginol and other unaltered terpenoids were detected. Here, we report the occurrence of relatively high concentrations of ferruginol derivatives and other polar diterpenoids as well as their diagenetic products in a fossil wood sample identified as a species of *Protopodocarpoxylon* Eckhold and *Xenoxylon phyllocladoides* Gothan from the Middle Jurassic (Bathonian) of the Polish Jura, south-central Poland and Middle Jurassic (Callovian) of the eastern part of the Polish Lowland.

The state of preservation of the wood fragments differs among specimens. Generally, they are either coalified and/or permineralized. The quality of preservation of the wood structure depends mainly on the time of permineralization after burial. Most of the wood samples display some bacterial attack on the cell walls, although the specimens studied as prepared peels have all diagnostic xylogenetic features. Thus, it can be hypothesised that, after a short drift and residence in salt-water, the woody fragments sank to an oxygen-poor sea-bottom, where they were rapidly buried in sediment. Mineralization processes began immediately after deposition.

The vitrinite reflectance ( $R_r$ ) measurements, conducted on the Bathonian and Callovian wood samples, gave the values 0.25 – 0.35 %, however some exceptions with the higher  $R_r$  values (0.45 – 0.50 %), caused by secondary oxidation processes, were also noted.

The solvent extract of the best chemically preserved samples contains aliphatic lipids, diterpenoids, triterpenoids and steroids (Fig. 1). The aliphatic lipids are composed of long-chain ( $C_{24}$ - $C_{29}$ ) *n*-alkanols and *n*-alkanoic acids. The predominant compound is the secondary alcohol *n*-nonacosan-10-ol accompanied by four *n*-nonacosanediols (10,13-diol, 7,13-diol, 5,10-diol and 7,10-diol). Major constituents of the extract are diterpenoids of the abietane,

labdane, and totarane classes which are known as common constituents of conifer resins. With the exception of simonellite and labdanoic acid, most of the diterpenoids are unaltered, preserved biomolecules as observed in extant plants, especially conifers. Comparable compositions of polar biomarkers were hitherto reported only from much younger geological samples, namely fossil plants, resins and coals of Tertiary or Cretaceous ages. The excellent preservation of polar molecules is caused by the limited biodegradation of natural product compounds in the resin due to the presence of antimicrobial phenols and/or the rapid burial of the wood in anaerobic sediments.

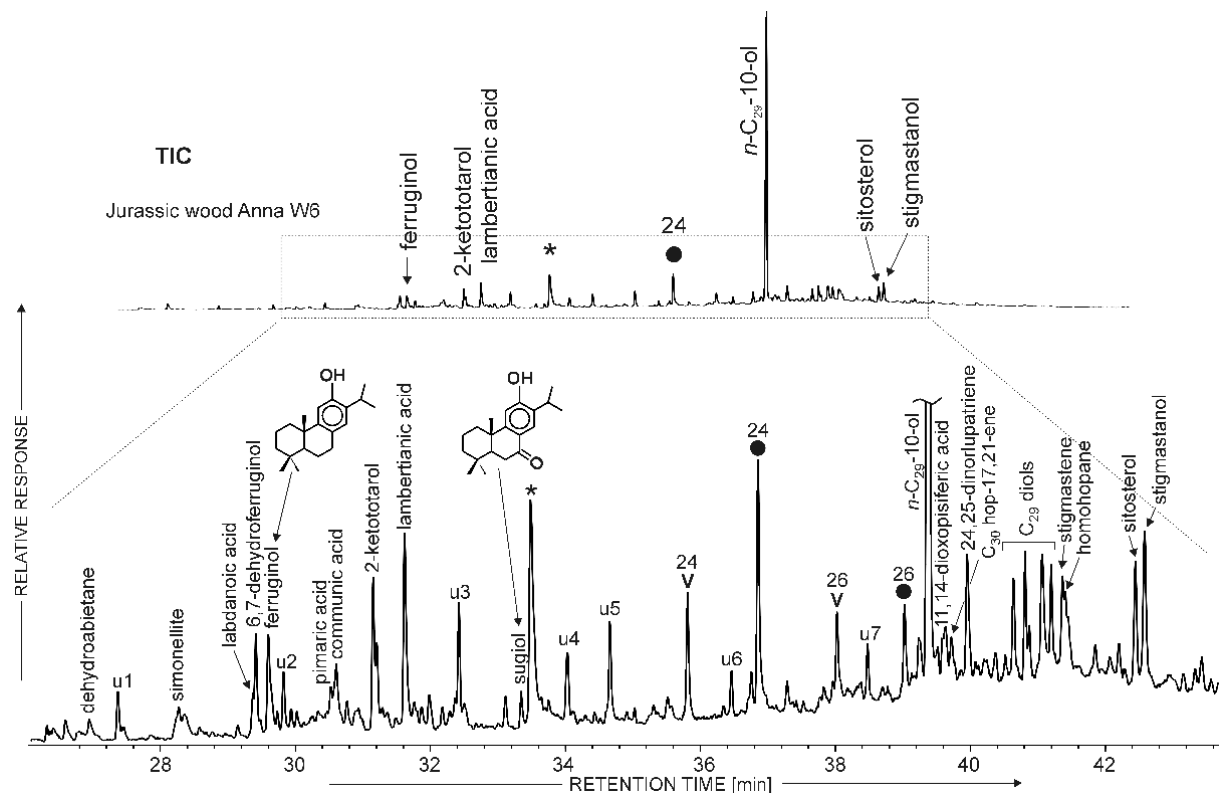


Figure 1. Mass chromatogram (TIC) of the silylated total extract (TMS derivatives) of the Jurassic *Xenoxylon phyllocladoides* wood from Poland. \* = contamination, v = *n*-alkanols, • = *n*-alkanoic acids, u1-u7 = unknown compounds. Numbers indicate the number of carbons in the aliphatic lipid series.

## REFERENCES

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