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Preservation of hemicellulose remnants in sedimentary organic matter.

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Streszczenie

Cellulose has been identified in fossil material, but the preservation potential of hemicelluloses, which are less resistant to decomposition than cellulose, is generally considered very low. Here we present the discovery of hemicellulose in Miocene xylites (fossil wood) and Cretaceous xylo-detritic coals from Poland. The main building blocks of hemicelluloses in softwood are mannose, glucose, xylose with lesser amounts of galactose and arabinose. These saccharides were detected in the coals and xylites using independent geochemical methods. Based on chemical analysis, the lignites contained significant holocellulose (22–37%), a-cellulose (8–29%) and hemicellulose (7–13%). In the smoke from a xylite burn test, levoglucosan and mannosan were dominant, the latter a specific hemicellulose alteration product. Glucose and mannose products dominated after methanolysis, with minor galactose and xylose. The main hemicellulosic polysaccharides in lignite appear to be glucomannan and/or galactoglucomannan but with a lower mannose content, possibly connected to wood degradation by fungi. The preservation of hemicelluloses in fossil material may be due to structural interconnection between lignin, cellulose and hemicellulose (i.e. lignocellulose), common in extant wood. This is the first documentation of hemicelluloses in fossil material. Our results show that not only cellulose, but also hemicelluloses can persist for millions of years under favorable conditions with only minor structural changes due to slow microbial and/or diagenetic decay. In fossil wood, types of hemicellulose can help assess whether the ancient plants were related to gymnosperms or angiosperms.

Słowa kluczowe

Saccharides, Hemicellulose, Glucomannan, Lignite, Miocene, Cretaceous, NMR spectroscopy, Fourier-transform infrared (FTIR) spectroscopy, Gas chromatography-mass spectrometry

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