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sa međunarodnim učešćem

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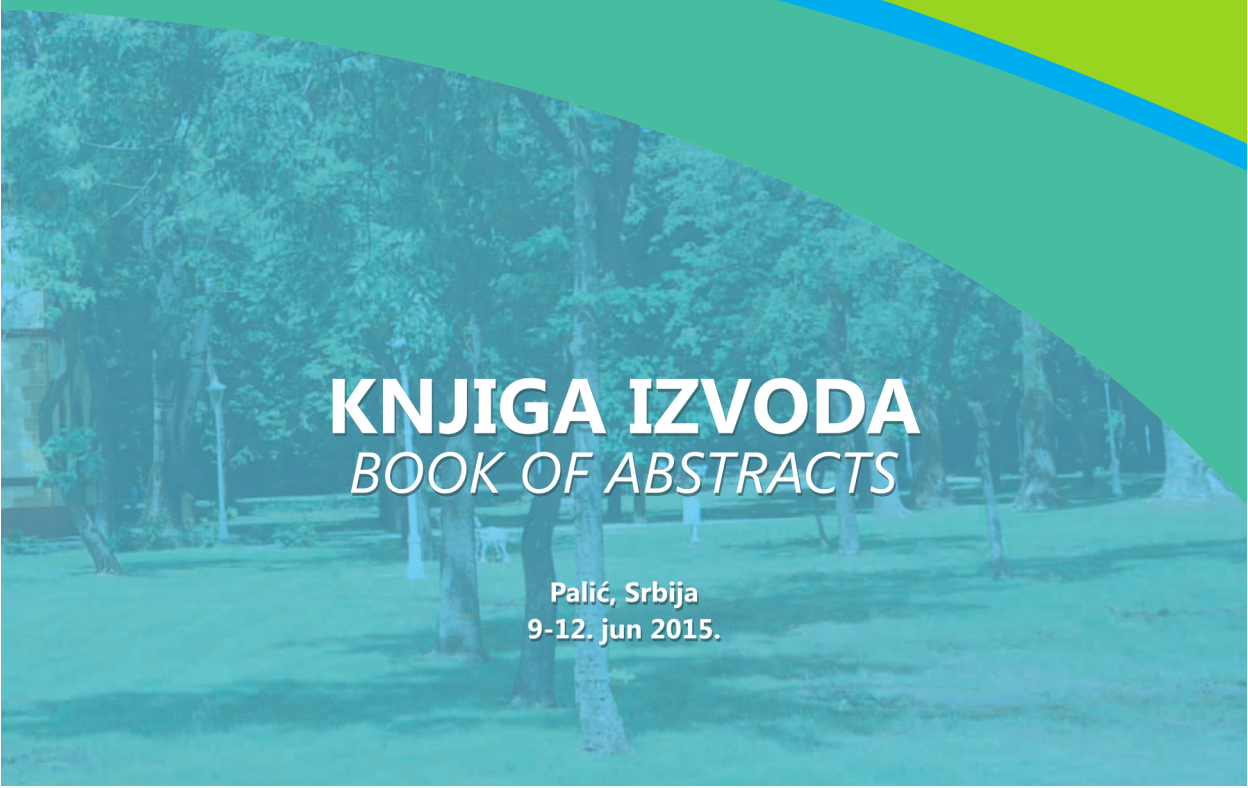

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Distribution of fatty acids and alcohols in lignites, from the Smederevsko Pomoravlje field, Kostolac Basin – biogeochemical approach

Nataša Đoković[1], Danica Mitrović[1], Achim Bechtel[2], Ana Medić[3], Nikola Vuković[4], Dragana Životić[4], Ksenija Stojanović[5]

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In present study, both lipid classes, fatty acids and neutral lipids (e.g. alcohols) were analysed in lignite samples in order to assess organic matter source and study biogeochemical and diagenetic alteration processes.

The choice of polar compounds as useful biomarker indicators is based on several considerations. As lipids, fatty acids are involved in energy storage, mobilization and in membrane structure in all living organisms, while sterols have roles in membrane function and hormonal regulation of metabolic processes primarily only in eucaryotes [1].

Pulverised lignites were extracted by an azeotrope mixture of dichloromethane and methanol (88:12, v:v) using a Soxhlet's apparatus. Extracts were dissolved in a mixture of *n*-heptane: dichloromethane (80:1, v:v) and asphaltenes were precipitated. The heptane-soluble organic compounds (maltenes) were separated into saturated hydrocarbons, aromatic hydrocarbons and NSO fraction (polar fraction, which contains nitrogen, sulphur, and oxygen compounds) using column chromatography. Portions of NSO fractions were concentrated after which the extracts were saponified with a mixture of 6% KOH in CH_3OH and distilled water (3:1, v:v) at 80°C (pH = 14). Fatty acids (FAs) and alcohols were analysed using a method modified from Wakeham and Beier (1991) [1]. Alcohols and FAs were extracted 3 times with *n*-hexane at pH 14 and pH 1, respectively using Na_2SO_4 for removal of the excess water. Prior to gas chromatography-mass spectrometry analysis (GC-MS), the FAs and alcohol fractions were derivatised with BSTFA (N,O-bis(trimethylsilyl)trifluoroacetamide, Fluka) for 1 h at 80°C to form trimethylsilyl esters and ethers.

The obtained results are as follows: the fatty alcohols ranging from *n*-C_{12} to *n*-C_{28} alkanols with a high abundance of long-chain fatty alcohols (*n*-C_{22} – C_{28}) and only trace levels of short-chain fatty alcohols (*n*-C_{12} – C_{18}) indicating the main terrestrial input into the system. The monounsaturated *n*-$C_{18:1}$ fatty alcohol, which has been found in some species of diatoms, *Skeletonema costatum* [2], was also present in samples. Steroidal alcohols, β-sitosterol (5-cholesten-24β-ethyl-3β-ol), stigmastanol (24α-ethyl-5α-cholestan-3β-ol) and cholesterol, which are the major sterols found in higher plants, are also found in small quantities. The presence of kauran-13-ol is in accordance with the premise of terrestrial origin, given that abietane, pimarane, kaurane and podocarpane skeletons are produced primarily by conifer vascular plants.

n-Alcanoic acids ranging from *n*-C_6 – C_{30} with a notable predominance of even chain-lenghts are present in samples, having the maximum at hexadecanoic acid ($C_{16:0}$). Saturated compounds dominate in distribution but two unsaturated fatty acids were also found, 9-octadecanoic ($C_{18:1}$) and 9-hexadecanoic acid ($C_{16:1}$). Apart from fatty acids, the polar fraction

contains 4,8,12,16-tetramethylheptadecan-4-olide (a fragment of chlorophyll molecule with a side phytol chain).

Typically high concentrations of long-chain (C_{22} –C_{30}) *n*-alkanoic acids and *n*-alkanols (C_{12} – C_{28}) with a sharp predominance of even homologues, certain hydroxyacids and dicarboxylic acids, diterpenoid acids, long-chain saturated alkyl (wax) esters are characteristic components of higher vascular plant cutin and suberin [3]. Biomarker analysis of aliphatic and aromatic fraction of lignite coal is in concordance with the results obtained in the investigation of polar compounds, confirming that in the case of Kostolac lignite, conifer terrestrial input was dominant source of organic matter.

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