Levoglucosan and other organic tracers of cellulose decomposition emitted from brown coal burning

MACIEJ RYBICKI[1], LESZEK MARYNOWSKI[1], MICHAŁ BUCHA[1]

[1]University of Silesia, Bankowa 12, 40-007 Katowice, Poland; e-mail: maciej.rybicki@us.edu.pl

Anhydrosaccharides such as levoglucosan (1,6-anhydro-β-D-glucopyranose), derived from cellulose burning (Simoneit et al., 1999), as well as mannosan (1,6-anhydro-β-D-mannopyranose) and galactosan (1,6-anhydro-β-D-galactopyranose) originated from thermal degradation of hemicelullose (e.g., Nolte et al., 2001; Fine et al., 2004) are considered as major tracers of biomass burningg (e.g. Simoneit et al. 1999; Simoneit 2002). However, preliminary studies of Miocene lignites from Poland indicate that all types of brown coals contain considerable amounts of holocellulose, up to 37% in xylites, and up to 6% in detritic coals. Thus, it cannot be ruled out that in many regions of the world, where lignites are used as a solid fuel, levoglucosan is mistakenly considered as derived from biomass burning, while its actual sources are probably combined biomass and lignite combustion.

Preliminary burning tests of lignites from Konin region (central Poland) have been carried out using high volume aerosol sampler. Samples were collected on quartz filters with a 47 mm diameter, then extracted in methanol: dichloromethane (1:1) solvent, derivatized with N,O-bis(trimethylsilyl) trifluoroacetamide (BSTFA), and analyzed using gas chromatography coupled with mass spectrometry (GC-MS). The results have shown that levoglucosan is a major polar compound in xylites and important or detectable in detritic coals, whereas mannosan and galactosan are also present in various concentrations. This indicates that it is possible that some part of anhydrosugars present in aerosols might originate from brown coal combustion, and not, as commonly believed only from biomass burning.

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