Biomass combustion – a possible source of environmental pollution?

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The content of selected elements in biomass (virginia fanpetals; cup plant; switchgrass; eastern cordgrass; miscanthus) grown on contaminated experimental field and in low-temperature ash obtained in 475ºC was studied. The soil is enriched in various elements (e.g. Zn up to 2000 ppm, Pb up to 430 ppm, Cd up to 19 ppm) and contains numerous components of anthropogenic origin (spherical dust particles from high-temperature industrial processes, fragments of various types of metallurgical slag, coal ash, etc.).

The content of potentially toxic elements determined in biomass is relatively high (e.g. Zn up to 545 ppm, Cd up to 8,5 ppm, Pb up tp 115 ppm, Hg up to 24 ppb). The content of these elements in low-temperature ash is very high (Zn from 4100 to >10 000 ppm, Cd from 30 to 207 ppm, Pb from 380 to 2870 ppm, Ag from 171 to 1048 ppb, As from 9 to 22.5 ppm, Hg below 0.5 ppb).

Detailed study of dry biomass indicates that high content of various elements is related partly to dust particles deposited on its surface (e.g. Pb, Cd and Zn sulphides, Zn containing clay minerals, Ca and Ba sulphates, particles rich in Fe, Cr, Ni, etc.) and partly to accumulation of various elements (e.g. Zn) in plant tissue.

Results indicate that in the case of biomass cultivated on the polluted sites risk of emission of elements characterized by low values of boiling point during fuel combustion or leaching of potentially toxic elements from ash to the environment is probable.

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Linking reactive silica with organic matter burial in Mississippi delta sediments

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Deltaic sediments account for ~40% of organic carbon burial in the oceans. Furthermore poorly crystalline Al-Si-(Fe)-phases precipitate on biosiliceous and clastic particles as a result of reverse weathering reactions in deltaic sediments [1]. Amorphous biogenic silica and poorly crystaline Al-Si-(Fe) precipitates are quantified as reactive silica (RSi). This study examines the links between RSi and sedimentary organic matter in Mississippi delta sediments and the implications for organic matter burial and preservation. Suspended matter and sediment samples from the Mississippi river and seven delta stations were analyzed for reactive silica (RSi), total organic carbon (TOC), total nitrogen (TN) and stable isotopes ($\delta^{13}C$, $\delta^{15}N$).

Top (>50cm) and bottom sediments from delta sites close to the river mouth have identical $\delta^{13}C$, $\delta^{15}N$ values, indicating similar OM sources. In top sediments RSi is not related to TOC or TN. Below 50cm, RSi correlates with TOC,TN suggesting a diagenetic control. Correlations in mid-shelf stations show that TOC:Si, TN:Si ratios decrease from top to bottom, indicating preferential loss of TOC and TN relative to RSi. Stronger coupling between RSi and preserved residual OM is found in mid-shelf sites where sediments are more diageneticaly altered. We propose that formation of Al-Si coatings on biosiliceous particles [2-3] may also partially inhibit the decomposition of diatom-bound OM. During burial, ~34% of residual sedimentary OM appears related to RSi in nearshore and mid-shelf deposits.

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