Trace elements in biomass fuel and biomass ash – a comparison with coal and coal ash

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Biomass combustion is often considered to be an easy way to produce renewable energy. Its advantages are also recognized (e.g., sustainable land use, security of supplies, conservation of fossil fuel resources, reducing of external energy dependence). On the other hand, biomass combustion causes technical, environmental, and social problems, together with adverse health effects.

In our study we compare the content of trace and potentially hazardous elements in wood biomass and its ash with coal and coal ash, discuss the emission of potentially hazardous elements during combustion and leachability of elements from ash. We studied six samples of biomass used in the medium size district heating boiler devoid of air pollution control system. We also studied the ash from this boiler and experimentally obtained low temperature (475ºC) biomass ash. Each sample of fuel was a blend of chips of different wood and their composition varied depending on supplier and the origin of biomass. The content of Cd, Mn, Zn, Sb, Tl in analyzed wood chips blends is comparable to or higher than the Clarke value for hard coal. Content of B, Cd, Cu, Pb, Sn, Zn, Sr, Rb in low temperature biomass ash is higher or similar to coal ash. Differences in chemical and mineral composition of ash obtained during combustion of each blend sample in the boiler at temperature above 800ºC are significant (e.g. SiO_2 varies from 21 to 76 wt%; CaO from 8 to 30 wt%; beside quartz samples contain calcite, wollastonite or portlandite as main mineral components) what indicates differences in fuels characteristics. Significant degree of volatilization during combustion at temperature >800ºC is suggested for Zn, Cd, Pb, As, Sb, Cu, Mo, Sr, Rb. Content of hazardous elements in solutions obtained during water leaching of ash is relatively low what could be related to generally low content of these elements in ash after burning cycle.

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