CHARACTERIZATION OF WOOD FLY ASHES FROM DIFFERENT DUST FILTER TYPES

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In Europe, the number of installations of small- and medium-scaled solid biomass combustion plants for heat and power production has been significantly increasing over the last decades. Wood chips comprise the main fuel source as wood is regionally available. Combustion of biomass, e.g. wood, is considered a renewable energy source, presuming forestry is performed in a sustainable fashion. Combustion of biomass produces heat, gases (mainly CO_2), particles and ash, which consists of the non-combustible constituents of the biomass. One portion of the ashes remains at the grate as bottom ash, and is mainly used as fertilizer additive, as it contains valuable nutrient elements such as calcium, potassium and magnesium. However, a significant fraction of the ash is fine-grained and thus transported as fly ash in the flue gas. Because the fly ash is transported in association with organic particles, the bulk material in the flue gas is described as dust.

To limit the emissions of dust into the environment, various particle filter techniques are being applied to the combustion plants. The most common filter types are cyclones, electrostatic precipitators and baghouse filters. According to the filter technology applied the collected particles, i.e. fly ashes, have various and fluctuating levels of not only main elements, but also heavy metals, chlorides and organic compounds. Therefore, fly ash is generally discarded from further use. However, instead of landfilling these ashes, they should be comprehensively investigated in order to elucidate their re-utlilization potential, which is considered being similar to that of fly ashes from coal combustion (i.e. as cementitious constituent).

In this study, fly ashes from various medium-scaled biomass combustion facilities equipped with different particle filters, were sampled on site. The samples were investigated by using X-ray diffraction and subsequent pattern analysis by the Rietveld refinement method to obtain semi-quantitative abundances of crystalline phases. Furthermore, X-ray fluorescence and atomic absorption spectroscopy was used to yield elemental compositions.

The chemical and mineralogical compositions of the different fly ashes were compared and assessed in terms of the relation to filter type and combustion conditions. Furthermore, the reproducibility was assessed by comparing multiple fly ash samples from the same source over time.