

The characterization of heavy metals in waste-based fuel by SEM-EDS and LA-ICP-MS

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1 Introduction

Waste materials are a potential source of fuel, since they contain biomass, paper, cardboard, plastics, rubber, and fabrics. Inorganic compounds that constitute ash may cause problems in the boilers and have environmental consequences. The knowledge of the chemical composition of fuel and ash will provide better understanding of the factors behind these problems.

SEM-EDS provides information about the spatial distribution of the chemical composition instead of average bulk concentrations. SEM-EDS results can be visualized by use of the quasiternary diagrams providing detailed information of the compositional distribution. LA-ICP-MS is suitable for the determination of trace contents of, for instance heavy metals. By combining the information obtained from fuel samples by different analytical methods, it may be possible to predict and prevent the fuel- and ash-related problems in boilers.

2 Objectives of the research

In this study, three waste-based fuels (I-III) have been analyzed. Samples I-II are household waste-based fuels, and sample III was wood-based fuel sample. SEM-EDS was used for quantitative determinations and LA-ICP-MS for qualitative examination.

3 Results

The results of the samples III have been visualized by quasiternary diagrams shown in Fig. 1. Sample I is a mixture of silicates. The content of phosphorus is substantially higher in sample II than in sample I. The calcium content is also higher in sample II than in sample I. Samples II and III contain heavy metals such as zinc, lead and titanium. Zinc and titanium are used as pigments in paints and lead may originate from building materials, especially in sample III (Fig. 1).

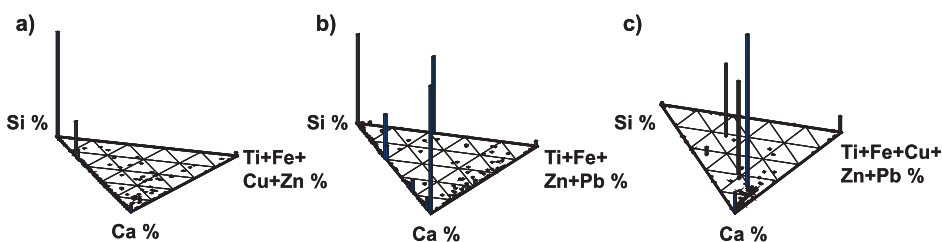


Figure 1 The quasiternary diagrams of the samples I, II, and III

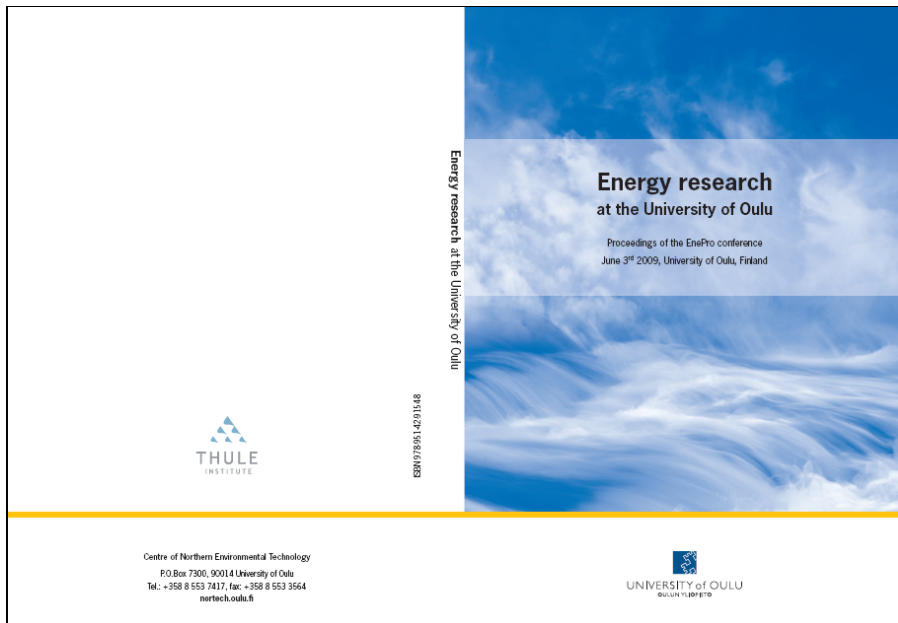
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