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Material Value Chains

Large scale treatment trials of WEEE

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Background and objectives

WEEE (Waste of Electrical and Electronic Equipment) is a growing waste stream containing a complex mixture of materials and components. Thus recycling and treatment procedure of WEEE plays a crucial role in order to increase the resource efficiency and metal recoveries.

The aim of the study was to increase information of the different type treatment methods and their effect on selected WEEE materials, liberation behavior, process optimization and metal recoveries on industrial scale processes.

Materials and methods

Materials were selected for the study due to their versatility of different materials and complexity of joining mechanisms and high contents of copper and precious metals:

- Power supply units (PSUs) from central processing units (CPUs)
- Two printed circuit board (PCBs) samples from different sources

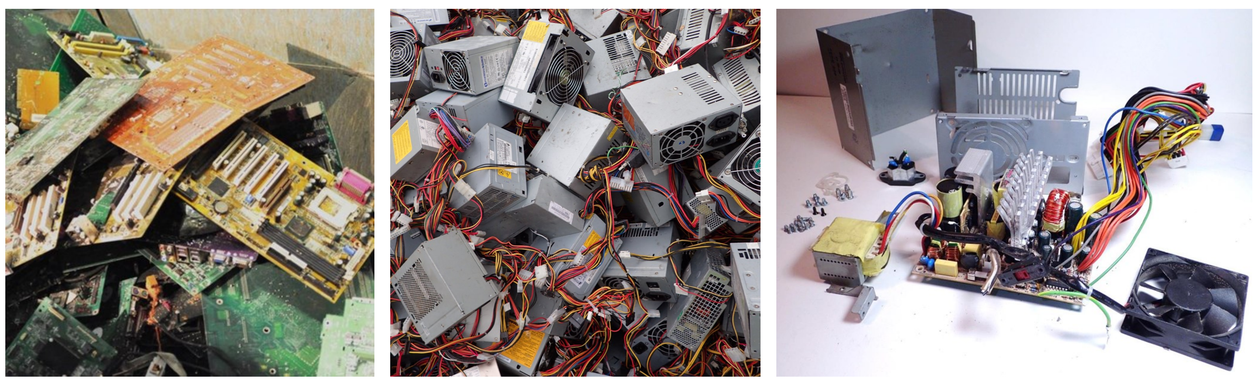

Figure 1. High value PCBs (left), PC Power supplies.

WEEE treatment and trial procedure :

- Manual presorting
- Shredding (ring crusher, knife shredder)
- Mechanical sorting
- Sampling and preparation (screening, melting)
- Analysis (ICP-OES, hand sorting)

Figure 2. Ring crusher (left), knife shredder.

Results

One of the most interesting result was the recovery of valuable metals in the mechanical treatment processes. Copper concentrate consists mainly of copper, precious metals, plastics and organic residues, hence it is the final product of the treatment process and can be further processed in secondary copper smelter. The results of the trials showed that the copper recovery rate was fairly good in all tests.

Table 1. Silver and copper recoveries

Recovery (%)	Silver	Copper
High value PCB (knife shredder)	68 %	78 %
Low value PCB (knife shredder)	68 %	71 %
Low value PCB (ring crusher)	66 %	74 %
PC Power supply (ring crusher)	70 %	77 %

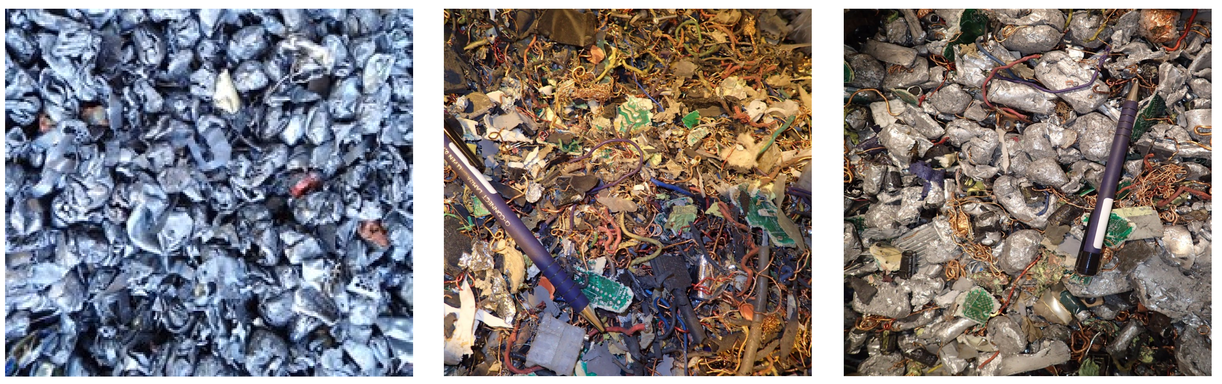

Figure 3. Products from PC Power supply trial; steel-, copper- and aluminum concentrates.

Conclusions

The study produced new information about the behavior of WEEE materials in selected processes and the particle sizes, liberation and recovery rates of different metals. Based on this knowledge WEEE treatment process and the recovery rates, especially of precious metals, can be further developed and enhanced. Based on increased material composition data, the material flows can be better directed to optimal processing in order to gain better material recoveries and decreased amounts of waste and dust.

References:
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