Plastics Composition of WEEE and Implications for Recovery

German scientists have recently investigated the plastics content in Waste from Electrical and Electronic Equipment (WEEE). The results show that the contamination of plastics by brominated flame retardants (BFR) and polybrominated dioxins and furans (PBDD/F) remains a severe issue and has a strong impact on material recycling and thermal treatment. This analysis provides useful information on the possible recovery of WEEE plastics.

In 2002, the European Commission adopted Directive 2002/96/EC on Waste from Electrical and Electronic Equipment (WEEE). By defining recycling and recovery quotas for 10 WEEE categories, the Commission is hoping to cope with the huge amounts of this type of waste that is growing constantly in Europe, driven by the ever-increasing use of information, communication and technology appliances. With an average plastics content of about 30%, the recycling and recovery of this material is a key issue in achieving recycling rates from 50% to 75% and recovery rates from 70% to 80% of WEEE as stated in the Directive. From a technical point of view, the recycling of WEEE plastics has hardly been possible due to their contamination by hazardous waste and other strongly regulated compounds, for example heavy metals and brominated flame retardants (BFR).

However, driven by the European legislations of the last few years, the contamination of WEEE plastics may have decreased. In this regard, German researchers recently monitored polymer types and hazardous compounds in European WEEE polymers coming from 45 single TV sets and monitors, from 7 shredded housing fractions and from 8 mixed WEEE shredder residues. The results of their measurements are:

- In the 45 single housings analysed, the diversity of polymers is found to be very low.
- There is more than 1% of bromine and 1% of chlorine for 27% and 16% of the housings respectively.
- Limit values defined in the Directive on RoHS are exceeded in up to 13% of the single housings, depending on the contaminant.
- Limit values defined in the RoHS Directive are exceeded in up to 71% and 63% of the shredded housings and mixed WEEE shredder residues, respectively.
- In comparison to former studies, polybrominated biphenyls (PBB) decreased to levels below limit of detection, whereas no clear indication was found for a decline of polybrominated diphenyl ethers (PBDE).

Regarding the low diversity of polymers found in housings, the researchers note that WEEE is an interesting source of polymer that can be recycled. However, prior to recycling waste fractions, the compliance with German and European requirements implies the elimination of contaminants.

The authors highlight that one of the consequences of the contamination of polymer fraction of WEEE is that material recycling is limited to defined fractions of WEEE plastics and to technologies capable to remove brominated contaminants. The researchers add that thermal treatment is consequently an important end-of-life management route at least for residual plastic fractions, especially regarding the high heating value of these materials. However, the high level of contaminants in some polymer fractions might lead to these materials being classified as hazardous. As a consequence, they should not be claimed as refuse derived fuels, which are intended not to produce further emissions when co-incinerated.

Overall, this study provides useful insights into the implications for the material recycling and thermal recovery of WEEE plastics.

1Technologies for removal of BFR have recently been evaluated by the British Waste & Resources Action Programme (http://www.wrap.org.uk/wrap_corporate/publications/index.html).


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Additional information: The EC’s LIFE programme co-finances a number of projects contributing to the objectives of the WEEE. These include the LIFE project “The Multi Life Cycle Centre for electric and electronic equipment” (LIFE04 ENV/AT/000007) aimed at realising an efficient, full service (i.e., all products and components) recycling plant for electric and electronic equipment (see project summary and website).

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