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REMOVAL OF FLAME RETARDANTS FROM THE NON-METAL FRACTION OF THE PROCESSED WASTE PRINTED CIRCUIT BOARDS USING ORGANIC SOLVENTS AND PYROLYSIS

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Abstract

Printed circuit boards are the most important component of any electrical and electronic device. The average metal content in waste printed circuit boards is ~30-35% whereas the rest of the material is a non-metal fraction (NMF). Metals in the waste printed circuit boards are recycled for their value whereas the NMF is mostly sent to landfills or incinerators for disposal. The circuit board laminates contain flame retardant chemicals that pose potential hazards to the environment and to public health and safety. The concentration of polybrominated diphenyl ether (PBDEs) and polychlorinated biphenyls (PCBs) reported in literature is limited to circuit boards prior to any processing, or to dust and soil near recycling centers. This paper studied the concentration of these flame retardants in the NMF and showed a concentration of 294 mg/kg for PBDEs and 3200 µg/kg for PCBs. It also showed that 90-95% of these chemicals could be extracted using organic liquids such as toluene and n-hexane: acetone (1:1 v/v) even at a larger scale. The paper also analyzed the concentration of harmful dioxins and furans, which get released during the incineration process.

Keywords: flame retardants, non-metal fraction, PBDEs, PCBs, printed circuit boards

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