

The clean recycling of waste printed circuit boards by pyrolysis technology

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Waste printed circuit board (PCB) is a typical electronic waste, which has dual characteristics of resource and danger. If it is not properly disposed, it will cause serious waste of resources and environmental pollution. In this study, a novel electric furnace was designed to manage waste PCB by pyrolysis technology. Typical electronic components, such as aluminum electrolytic capacitor and slot, in waste PCB were pyrolyzed at different temperature. The results showed that different electronic components had the similar pyrolysis technological conditions and hence the waste PCB could be pyrolyzed without electronic components demolition in advance. The waste PCB with electronic components pyrolyzed at 700°C for 10 min. During the pyrolysis process, the organic part was decomposed to pyro-oils and pyro-

gases: the solid residues of about 65-70 wt.%, liquid yields of 18-20 wt.%, and gas yields of 10-12 wt.%. The pyro-gas is rich in CO, CO₂, H₂ and CH₄, and it could be combusted for the pyrolysis self-sustain after being purged. On the other hand, the pyro-oil was rich in phenol and its homologue, which could be used as fuels or chemical materials. Dioxin concentration in the pyro-gas was 0.046 ngTEQ/m³, which was lower than the emission standards. The tensile strength of the solid residues was significantly reduced after pyrolysis process, which was beneficial to subsequent crushing process and the separation of metal and glass fiber. Based on this study, a clean recycling of waste PCB by pyrolysis technology had been applied to industrial production in May, 2017.

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