Process line for the automated dismantling and sorting of valuable components from printed circuit boards

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Within the European project ADIR (www.ADIR.eu), a consortium of R&D institutes and companies have developed processes and machines to demonstrate the feasibility of a novel approach for an automated selective disassembly of consumer and professional electronics. The target of the ADIR project is to use selective physical separation methods to improve on existing means for extracting valuable materials from end-of-life (EOL) electronics.

Large streams of EOL electronics stem from mobile phones (MPHs) and printed circuit boards (PCBs) from servers and switching electronics for telecommunication purposes. They comprise a significant amount of valuable materials, some of these are considered to be critical metals. The European Union strives to improve the supply security of these metals and has launched various programs and projects to tackle this task. Analyses of circular economy strategies for mitigation of critical material supply issues point out the importance of recycling to provide secondary sources of critical materials.

Within the ADIR project the R&D efforts are especially focused on tantalum in capacitors and SAW filters (surface acoustic wave filters), tungsten in the imbalance mass of vibration alerts, neodymium in magnets of loudspeakers and precious metals in integrated circuits and printed circuit boards.

Whereas input materials and components are – as a rule – known for conventional industrial production, the situation of a process line treating end-of-life electronics is much more challenging. The variety of features of the material to be processed is very broad and often there is limited or no information available.

Two classes of input material were studied in ADIR: i) MPHs, ii) printed circuit boards from servers and computers. Since the variety of different MPH types and models is very large, a representative selection was defined covering abundant types of older types of MPHs as well as smart phones. The paper gives an overview of the developed processes and machines, the conducted field tests and their evaluation, the recovery rates of valuable materials and last not least economic estimates.