A CASE STUDY OF DEFECTIVE AND END-OF-LIFE MEMS RECYCLING OPPORTUNITIES

Authors:

M. B. Rossi,[1] S. Martinez-Lozano[1]

1. LEITAT Technological Center, C/ de la Innovació 2, 08225 Terrassa (Barcelona), Spain.

mrossi@leitat.org

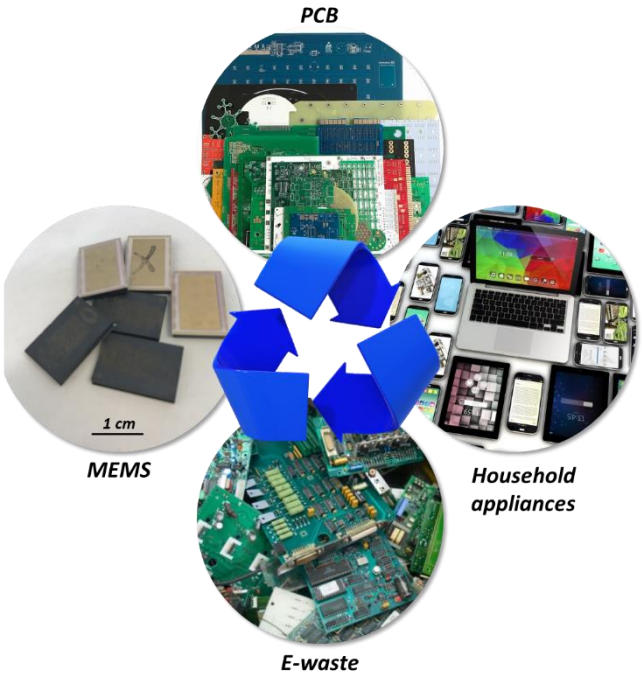
Over the last decades, micro and nano-manufacturing were driven by micro-electro-mechanical systems (MEMS), being part of a wide variety of consumer electronics. They all combine a huge variety of functions in a small volume size. However, production defects may occur in such miniaturized and highly 3-dimensionally complex structures, leading to unexpected process behavior.

The CITCOM project (http://www.citcom.eu) aimed to deliver an inline and fully automated 3D inspection system for MEMS manufacturing market, in order to allow defects to be detected at early production stage and, consequently, minimize discarded products.

Micro-electronics industry produces devices that contain *critical raw materials* (e.g., PGM, REE), within a small volume. Currently, there is no valorization route specifically designed for metal recovery from defective and end-of-life MEMS and/or products containing MEMS.

In this work, a thorough analysis of 217 e-waste recycling companies, among European Union, was performed. These companies were classified according to their core commercialized technologies, covering physical and chemical separation processes.

Based on mature market technologies and physic-chemical properties of sorted waste streams found at a MEMS production site, theoretical recycling routes were proposed at pilot scale, focused on the recovery of the most valuable metals that can be found in MEMS devices.



Circular life cycle of products containing MEMS.

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