INNOVATIVE CIRCULAR PROCESS FOR THE ELECTROCHEMICAL RECOVERY OF THE BASE METALS FROM WASTE PRINTED CIRCUIT BOARDS

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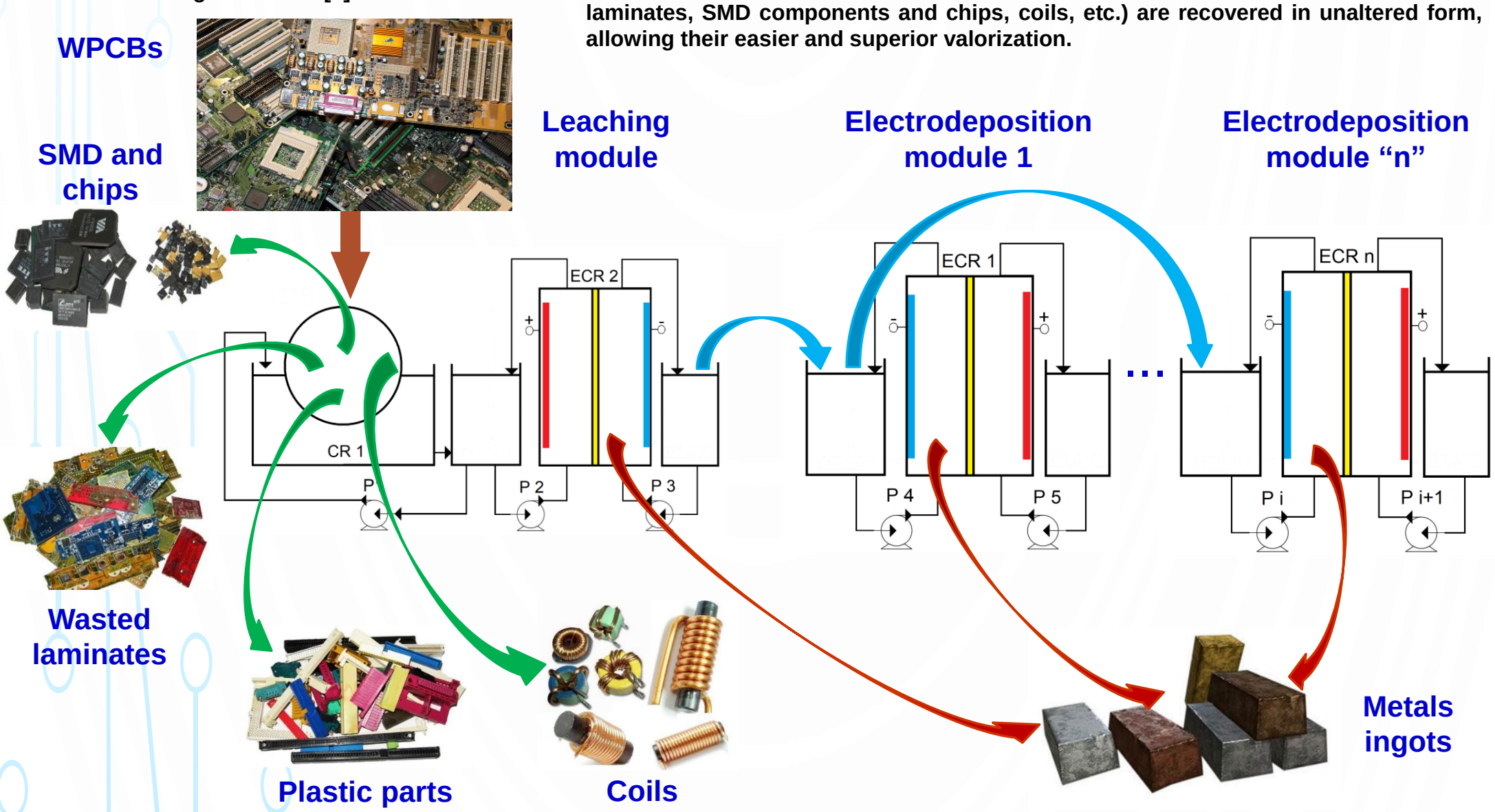
INTRODUCTION

The rapid technological innovations and natural resources decline [1] transforms the waste from printed circuit boards (WPCBs) in a huge source of recovered metals [2]. Otherwise, the inadequate WPCBs treatment involves a huge threat to the environment and human health [3]. Consequently, the development of recovery strategies is of supreme importance for the environment, but also in terms of valuable raw material existing in WPCBs [4].

INNOVATION

This work describes an original and innovative process used for the complete recycling of WPCBs resulting from depleted computers. Using the bromine/bromide leaching system, the proposed and tested technology allows, in a theoretical 100% closed circuit, the integral recovery of the exposed base metals (Cu, Sn, Pb, Ni, Fe, Zn and Al) from WPCBs. The process uses a combination of chemical and electrochemical steps, that allows the base metals dissolution in parallel with the electrochemical regeneration of the leaching solution and the electrodeposition of pure copper. In the next steps, the remaining dissolved metals can be also recovered from the leaching solution by electrodeposition. Moreover, the other recyclable materials included in the WPCBs (*e.g.* plastic parts, fiber glass/epoxy wasted laminates, SMD components and chips, coils, etc.) are recovered in unaltered form, allowing their easier and superior valorization.



CONCLUSIONS

- **The proposed original technological processes allow their operation in a closed loop, ensuring easily, total and efficient regeneration of all involved reagent's flows, with an extremely low environmental impact.**
- **Based on all performed measurement, it turned out that the proposed and tested processes are perfectly feasible, allowing to obtain deposits of high quality and purity, with a high commercial value.**

ADVANTAGES

- **The proposed processes can be easily managed by electrochemical monitoring of the essential parameters (concentration, pH, ORP), ensuring their high energy efficiency.**
- **The solid resulting solid fractions can be easily separated from the solutions by simple decantation and/or filtration.**
- **High-quality and valuable final products can be easily obtained.**
- **The impact over the human health and environment is extremely low.**

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