

Association of Metallurgical Engineers of Serbia
Faculty of Technology and Metallurgy, University of Belgrade
Institute for Technology of Nuclear and Other Mineral Raw Materials
Institute of Chemistry, Technology and Metallurgy
Vinca Institute of Nuclear Sciences
Serbian Foundrymen's Society

MME SEE

2019

Metallurgical & Materials
Engineering Congress
of South-East Europe

BOOK OF ABSTRACTS

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INTEGRATED RECYCLING OF THE CRITICAL RAW MATERIALS FROM WASTE ELECTRONICS

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Materials scarcity and supply risks have become significant issues. Accordingly, high efficient material valorization from secondary sources has emerged as a response to the resource pressures and demand for more sustainable production models.

Among others, waste electrical and electronic equipment (WEEE) represent a secondary material which contains a significant amount of critical materials. However, considering the established industrial practice which is mostly focused on the recovery of Cu and Au, this waste is not processed correctly, which eventually hinders its true potentials. A range of techniques and operations are currently applied for materials recovery from WEEE. The essential features of these systems generally follow the scheme of independent pre-processing (disassembly, size reduction, separation) and end-processing (reductive smelting, pyro-hydro-electro refining) operations. However, in this way, both functional and sustainable recovery of materials is not implemented correctly, which leads to lower recoveries and losses of the metal values. Additionally, due to the high material diversity, different elements, with different metallurgical properties and in different concentrations are introduced, why process control is much more difficult. Therefore, the development of the highly efficient process for selective metals recovery is crucial for overall improvements.

This paper presents experimental results for selective metals recovery from WEEE combining the different pyro-hydrometallurgical operations. Experimental results showed that due to the complex metallurgical reactions, pure pyrometallurgical treatment leads to the distribution of metals in melting products, deviating from the theoretical and expected. However, these results led to a more comprehensive understanding of the reaction systems and contributed to an optimized design of processing operations. This will allow recycling companies to become competitive in the regional market and beyond, which is particularly essential for small and medium enterprises with lower operating capacities.

Successful implementation of the developed state-of-art technological process, guarantee a more efficient approach to recycling processes, production of new materials which supports the concepts of sustainable development and circular economy.

Keywords: recycling, critical materials, WEEE, circular economy.