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Smart Energy Utilization for Metallurgical Recycling of Battery and Electronic Waste

JOSEPH HAMUYUNI,[1] FISEHA TESFAYE ,[2,4] and CHUKWUNWIKE O. ILOEJE[3]

1.—Metso Research Center, Kuparitie 10, 28101 Pori, Finland. 2.—Johan Gadolin Process Chemistry Centre, Åbo Akademi University, Henrikinkatu 2, 20500 Turku, Finland. 3.—Energy Systems and Infrastructure Analysis Division, Argonne National Laboratory, 9700 South Cass Avenue, Lemont, IL 60439-6903, USA. 4.—e-mail: fiseha.tesfaye@abo.fi

OVERVIEW

E-waste is growing both in variety and volume from year to year, requiring smarter solutions for processing it more efficiently and sustainably. Development of sustainable and efficient recycling practices will also offset dependence on scarce primary resources, reduce consumption of energy for metals production while managing environmental issues related to hazardous materials from the e-waste streams.[1] However, recycling of battery and other electronic waste by various metallurgical processing poses multiple challenges. Notably, one such challenge is energy consumption or utilization in processing. As the industry grows, researchers are progressively developing energy solutions to overcome this challenge and make metallurgical processing of these wastes more attractive.

THE SPECIAL TOPIC

Earlier this year, *JOM* advisors of the Energy and Recycling and Environmental Technologies Committees of TMS (The Minerals, Metals and Materials Society) published a special topic "High-Temperature Phases and Processes for Enabling Cleaner Production of Metals and Energy," focusing on the advancement of environmentally friendly and economic production of metals and renewable energy technologies.[2] For this special topic, original research papers discussing various solutions to the energy challenges that aim to frame a comprehensive discussion and data sharing to promote the advancement of metallurgical recycling of battery and electronic waste were invited. The papers selected after peer review in this special topic provide updates on advances in energy efficiency, increased extraction and recovery, etc., pertaining to the recycling of spent Li-ion batteries. They should therefore be of interest to a broad readership, including those with a general interest in energy efficiency in metallurgical processes.

ARTICLE SUMMARIES

The articles peer reviewed for publication in this special topic are all focused on improving Li-ion battery recycling. All titles and authors of the four articles published under this topic (vol. 75, no. 9) are listed below. The full papers can be accessed via the journal's page at: https://link.springer.com/journal/11837/volumes-and-issues/75-9.

I. **Title:** The Characterization of Li-ion Batteries and the Importance of the Recycling Processes
Authors: L. Guimarães, A. Botelho Junior, D. Romano Espinosa

II. **Title:** Efficient Direct Regeneration of Spent $LiCoO_2$ Cathode Materials by Oxidative Hydrothermal Solution
Authors: Z. Fei, Y. Xing, P. Dong, Q. Meng, Y. Zhang

III. **Title:** Preferential Recovery of Lithium Based on Mineral Phase Reconstruction from Spent Lithium-ion Batteries
Authors: K. Wang, Y. Zhang, L. Chen, Y. Huang

Joseph Hamuyuni, Fiseha Tesfaye, Chukwunwike Iloeje, Hong Peng are Guest Editors for the TMS Energy Committee, Recycling and Environmental Technologies Committee, and Process Technology and Modeling Committee and organized the topic Smart Energy Utilization for Metallurgical Recycling of Battery and Electronic Waste in the September 2023 issue of *JOM*.

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IV. **Title:** Highly Selective Lithium Extraction from Spent $LiFePO_4$ by Battery Roasting-Water Leaching Method

Authors: Q. Liu, Q. Wen

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CONFLICT OF INTEREST

On behalf of all authors, the corresponding author states that there are no conflict of interest.

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2. F. Tesfaye, J. Hamuyuni, C.O. Iloeje, H. Peng, and D. Verhulst, *JOM* 75(5), 1435 https://doi.org/10.1007/s11837-023-05777-8 (2023).