**Title: Classification of spent Li-ion batteries based on ICP-OES/X-ray characterization of the cathode materials**

Dear Editor,

Thank you for giving us this opportunity to revise our manuscript in accordance with the suggestions of the reviewer to whom we also wish to thank for very useful comments. They helped us to improve our manuscript and represent better our main goals. In the revised manuscript, all changes are given in yellow color. Finally, several new references are added as follows:

[19] Bernardes AM, Espinosa DCR, Tenório JAS. *J Power Sources.* 2004; 130: 291–298. <https://doi.org/10.1016/j.jpowsour.2003.12.026>

[20] Li X, Wang T, Pei L, Zhu C, Xu B. Conference Proceeding. In: *Proceedings of IEEE Transportation Electrification Conference and Expo (ITEC) Asia-Pacific 2014.* Beijing, China, 2014, 1–6. <https://doi.org/10.1109/ITEC-AP.2014.6940724>

[21] Lyu C, Song Y, Wang L, Li J, Zhang B, Liu E. *Journal of Energy Storage*. 2019; 25: 100885. [https://doi.org/10.1016/j.est.2019.100885](https://doi.org/10.1016/j.est.2019.100885" \o "Persistent link using digital object identifier" \t "_blank)

[22] Chen H, Shen J. *PLoS One.* 2017; 12: 1–15. https://doi: 10.1371/journal.pone.0185922

[23] Yoon S, Hwang I, Lee CW, Ko HS, Han KH. *Journal of Electroanalytical Chemistry*. 2011; 655: 32–38. <https://doi.org/10.1016/j.jelechem.2011.02.013>

[24] Pei L, Wang T, Lu R, Zhu C. *J Power Sources*. 2014; 253: 412–418. <https://doi.org/10.1016/j.jpowsour.2013.12.083>

[25] Kim J, Cho BH. *Energy*. 2013; 57: 581–599. <https://doi.org/10.1016/j.energy.2013.04.050>

[26] Ohshima T, Nakayama M, Fukuda K, Araki T, Onda K. *Electrical Engineering in Japan*. 2006; 3: 17–25. <https://doi.org/10.1002/eej.20249>

With respect,

Dragana Medić

**RESPONSES**

As suggested, the text starting from the Line 95 to the Line 101 (in the original version of the manuscript) is removed from the section Introduction and placed in the section Experimental (Lines 110 - 117 in the revised manuscript); it is also minimally corrected as follows:

“The characterization of the cathode material in the collected samples of battery cells was done in the experimental part of the present study using inductively coupled plasma - optical emission spectrometry (ICP-OES), as one of the most accurate methods for elemental analysis, and practically, for the detection of metals present in the cathode materials, while their crystal structures were identified using X-ray diffraction method. The identification of the cathode materials was performed after a specific pre-treatment consisting of: discharging of the spent cells, dismantling, separation of the main cell components (cathode, anode and separator), and removing of the cathode material from the Al-foil.”

At the same time, the section Introduction is modified at its end (starting from the Line 91 in the original version of the manuscript) as follows:

“It is the fact that many large companies already have their own machines for batteries sorting developed on the basis of their physical properties. For example, the Philips company, developed a sorting mashine based on battery dimensions, mass and electromagnetic properties [19]. In addition, there are some opinions that many other battery characteristics and parameters may be used as sorting criteria in recycling processes, such as the cell capacity, internal resistance, open circuit voltage, self discharge rate etc. [20]. These characteristics are typical monitoring parameters in the processes of separation of healthy cells from the bad ones in used battery packs or modules [21]; they are chiefly but not exclusively affected by the ingredient, or content and structure of the battery material; namely, the applied temperature, state of health, state of charge, charge/discharge current rate, etc. may also represent very important influential factors [20]. There are many examples in the scientific literature on sorting based on capacity and internal resistance [22], or sorting based on electrochemical impedance spectroscopy [23], sorting based on voltage curve [24], sorting based on dynamic parameters [25], sorting based on thermal behavior [26], etc.

In this paper, the possibilities for the classification of spent LIBs based on the type of the cathode material were investigated with the main aim of demonstrating that this approach can make the sorting of Li-ion batteries more precise and profound.”