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## RECYCLING AND DISPOSAL OF LITHIUM-ION BATTERIES

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The development of green energy, electric vehicles, and comprehensive recycling of resources are critical aspects on the way to sustainable development, considering that the energy crisis and environmental security are two problems that need immediate solutions (Liang et al., 2021). The transition to renewable energy sources can ensure the end of the fossil fuel era. Electrochemical storage systems, particularly lithium-ion batteries (LIBs), are key technologies to successfully implement this transition (Brückner, Frank, & Elwert, 2020).

First introduced to the commercial market in the 1990s, LIBs have gained rapid adoption and have become one of the fastest growing technologies in energy storage. The main advantages of these batteries are high energy and power density, high reliability and long service life. A total of approximately 10.5 trillion watt-hours of EVs are projected to be generated by 2030, of which electric vehicles (EVs) will account for 77%. The duration of service of LIBs depends on their application in various areas. Typically, in consumer electronics, the life of a LIB is 1-3 years, while for more powerful applications, such as energy storage, this life is usually 8-10 years.

Used LIBs contain significant amounts of valuable metals such as lithium (Li), cobalt (Co), nickel (Ni), manganese (Mn), iron (Fe), copper (Cu) and aluminum (Al). Due to the rapid increase in the production of LIB, the prices of these metals are increasing sharply, in particular for strategic cobalt, the price of which has increased four times in the last two years - from 22 dollars per kilogram to 81 dollars. Therefore, the used LIB should be considered as waste containing valuable strategic materials, taking into account the principles of sustainable development.

To date, developed countries are actively demonstrating successful experience in solving the problem of processing spent sources of electricity by implementing a state policy on environmental protection. However, there are currently no regulatory acts in Ukraine that would regulate the process of dealing with used LIBs. Ukraine should develop a regulatory and legal framework that provides for the responsible attitude of both producers and consumers to used LIBs. It is necessary to organize the collection and logistics of the used LIB to the places of their further processing and to raise the environmental awareness of citizens, emphasizing that the separate collection of waste is the only way to achieve a clean environment. It is also important to inform citizens about the harmful effects on health of throwing batteries into landfills together with household waste.

### *References:*

- Brückner, L., Frank, J., & Elwert, T. (2020). Industrial recycling of lithium-ion batteries – A critical review of metallurgical process routes. *Metals*, 10(8), 1107.
- Liang, Z., Cai, C., Peng, G., Hu, J., Hou, H., Liu, B., ... & Yang, J. (2021). Hydrometallurgical recovery of spent lithium ion batteries: environmental strategies and sustainability evaluation. *ACS Sustainable Chemistry & Engineering*, 9(17), 5750-5767.