

Abstract

[Research Title]

Appropriate Management Measures of Lithium-Ion Batteries at Recycling and Disposal Processes
based on Investigation of Fire Accidents

Project Period (FY) :	2021-2023
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Cooperated by :	Mizuho Research & Technologies, Ltd., Yokohama National University, E&E Solutions Inc.
Keywords :	Lithium-ion batteries (LIBs) Fire, ignition and other incidents Non-combustible waste Small waste electrical and electronic equipment (WEEE) Monitoring

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The actual situation of fire accidents caused by lithium-ion batteries (LIBs) at municipal waste treatment and recycling facilities was clarified through a survey of existing accidents, model experiments and model calculations for safety evaluation to clarify the fire accident mechanism, and real-time monitoring at the actual facilities.

The model experiments revealed that LIBs with a high state of charge (SOC) and high electric power (Wh) are at high risk of ignition, and the mechanism of delayed ignition, in which several hours or more elapse, was also elucidated. Real-time monitoring of LIB ignition phenomena at an actual facility was conducted several times, and temperature behavior, flame detection, and gas generation were confirmed.

Basic information such as LIB weight, capacity, and power consumption by item was developed, and items considered to be at high risk of ignition were identified.

As a future scenario estimation, end-of-life LIB generation were estimated to reach a maximum of more than 10,000 tons in FY2037 from 8,162 tons in FY2020, while the current recovery by Japan Portable Rechargeable Battery Recycling Center (JBRC) and others was estimated to be 14% of emissions.

A survey of LIB mixed in non-combustible waste revealed that although LIB-containing small home appliances account for only 0.3% of total noncombustible waste, they are the cause of most fire, ignition and other incidents.

The amount of fire damage at municipal waste treatment facilities caused by LIBs was estimated to be about 10 billion yen.

Furthermore, the effectiveness of countermeasures through separate collection and sorting was quantitatively demonstrated, and the cost and effectiveness of multiple countermeasure scenarios were

presented and proposed. These fire incident prevention measures were compiled into a guideline, and awareness-raising activities, including videos, were vigorously implemented.

[References]

Terazono A., Oguchi M., Akiyama H., Tomozawa H., Hagiwara T., Nakayama J. (2024) Ignition and fire-related incidents caused by lithium-ion batteries in waste treatment facilities in Japan and countermeasures. *Resources, Conservation & Recycling*, 202 (107398), 1-13
<https://doi.org/10.1016/j.resconrec.2023.107398>

This research was funded by the Environment Research and Technology Development Fund (ERTDF).