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Greener technology of lithium batteries is needed for healthy humans and nature

Keywords Green technology; Lithium batteries; Recycle problems; Second asbestos problem; Toxic gases

Dear Editor,

For lithium batteries, the article described critical comments on green technology [1]. This paper highlights the problems of green technology in lithium batteries. This is because the problems of lithium batteries must not become a second asbestos problem. Asbestos was a dream material because of its abundance, low cost, excellent insulation, flame retardance, and chemical resistance, but now it has become a health hazard nightmare.

Michael Funk et al. wrote the similar article entitled ''A cleaner, greener future for chemicals'' [2]. The 2019 Nobel Prize in Chemistry has been awarded for the development of lithium-ion batteries, which have made portable electronic devices rechargeable almost anywhere on the planet.

The safety of lithium-ion batteries has raised significant concerns by experts [3]. This paper addresses the safety issues in order to avoid Lithium batteries becoming a second asbestos problem.

Lithium-ion batteries do not contain hazardous substances such as mercury, lead, or cadmium, but they do produce toxic gases when heated [4]. Toxic gases include carbon dioxide (CO_2), hydrogen fluoride (HF), phosphoryl fluoride (POF3) and carbon monoxide (CO).

Lithium-ion batteries have been used in our smart phones so that the toxic gases may be hazardous in special situations. We must recognize these features of lithium batteries and communicate these features to the general public.

Lithium batteries are generally safe and unlikely to malfunction as long as there are no defects and the batteries are not damaged. Chen summarized malfunction conditions including fulfilling testing standards, thermal runaway on mechanical, electrical and thermal abuse [5].

However, when lithium batteries fail to operate safely, they may present a fire or explosion hazard [6]. More than 25,000 overheating or fire incidents — involving more than 400 types of lithium battery-powered products — occurred between January 2012 and July 2017, according to the Consumer Product Safety Commission's Status Report on High Energy Density Batteries Project, published on Feb. 12, 2018 [7].

A partial survey of its largest members undertaken by the Environmental Services Association in the UK found that in the 2019—2020 year to March, 670 fires were recorded, of which 145 could be attributed directly to Lithium-ion batteries [8].

Lithium-ion batteries are most dangerous when their life cycle is over, according to an International Solid Waste Association report [8].

Since the lithium-ion batteries are relatively small so that we have been facing the recycling problems. The automobile lithium-ion batteries have the same recycling problem [9]. Without solving the recycling problem, the world's transition to electric vehicles may not be possible [9].

We don't need to wait for green technology to be invented for lithium batteries. Immediately, we need new national and international regulations on safety and recycling for our precious Lithium and Lithium batteries.

The current lithium battery regulation is determined by only the size: ''Medium batteries transported by air or sea are fully regulated as Class 9 materials and must meet all regulatory requirements. Large lithium batteries — fully regulated as Class 9 material for all modes of transport''. In addition to the size of lithium batteries, safety robustness must also be considered in terms of the operating environment.

From a green technology perspective, we can summarize the following challenges of lithium batteries:

- beyond lithium, search for alternatives to lithium;
- high-power, long-life, and fast charging technology;
- no toxic gas production when heated;
- wider operating temperature range;
- enhancing safety for reducing all kinds of risks;
- reducing production cost.

In order to avoid becoming a second asbestos problem, the above problems must be overcome as soon as possible. If the current issues regarding safety and recycling are not resolved, lithium batteries could become a second asbestos problem, potentially causing harm to human health.

We need to solve the challenges of lithium batteries mentioned in this paper. If the safety and recycling issues addressed in this paper are not resolved, lithium batteries may become a second asbestos problem. With/without the solutions, we need new national and international regulations on safety and recycling for lithium batteries regardless of our challenges. Public users need to be aware of the characteristics of lithium batteries for safety and recycling.

Human and animal rights

The authors declare that the work described has not involved experimentation on humans or animals.

Informed consent and patient details

The authors declare that the work described does not involve patients or volunteers.

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Author contributions

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Disclosure of interest

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Y. Takefuji
Faculty of Data Science, Musashino University, 3-3-3 Ariake Koto-ku, Tokyo 135-8181, Japan

E-mail address: takefuji@keio.jp

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