



Disassembly Automation for Recycling End-of-Life  
Lithium-Ion Pouch Cells LIURUI LI,<sup>1</sup> PANNI  
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1.???Department of Mechanical Engineering,  
Virginia Tech, Blacksburg, VA 24060, USA.

2.???e-mail: zhengli@vt Rapid advances in the use  
of lithium-ion batteries (LIBs) in

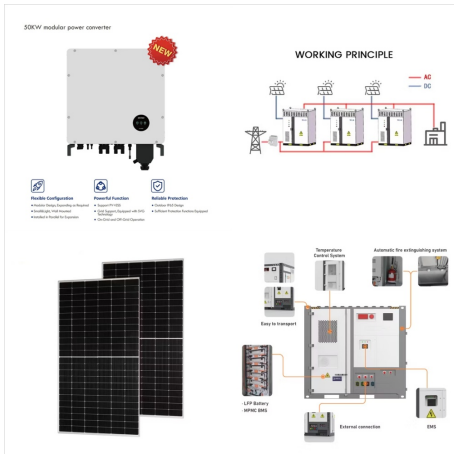


Many factors contribute to complexity of e-waste  
management, notably hazard of volatile batteries.  
Batteries including Lithium-Ion (LIBs) and Lithium  
Polymers (LiPo) store large amounts of energy  
contributing to high number of battery fires. and  
research into extraction and 33rd CIRP Design  
Conference Automated Disassembly of Lithium



With the surging interest in electric vehicles (EVs),  
there is a need for advancements in the  
development and dismantling of lithium-ion batteries  
(LIBs), which are highly important for the circular  
economy. This paper introduces an intelligent hybrid  
task planner designed for multi-robot disassembly  
and demonstrates its application to an EV  
lithium-ion ???

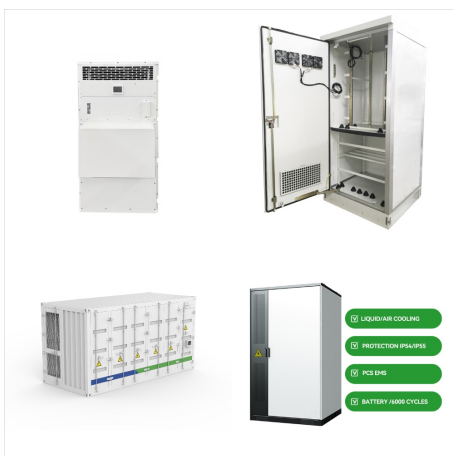
# LITHIUM ION BATTERY DISASSEMBLY



In their research they review current available and emerging technologies that are expected to ease the transition towards more flexible and automated disassembly systems. Since lithium-ion battery systems contain a lot of valuable materials (e.g. lithium, cobalt, copper, aluminium) several approaches have been developed to recover these



Techno-economic and environmental disassembly planning of lithium-ion electric vehicle battery packs for remanufacturing. Author links open overlay panel M reuse, remanufacturing, recycling or disposal. The lithium-ion (Li-ion) battery from the Audi A3 Sportback e-tron Hybrid is selected as the case study. Different case study scenarios



This literature review focused on battery pack disassembly through automatic machines, privileging robotic solutions. The interest in using robots for disassembly devices at their EoL has become increasingly important in the last few years [1]. Robotic disassembly involves several research topics such as Task and Motion Planning (TAMP), robot tool design, and ???

# LITHIUM ION BATTERY DISASSEMBLY



Only a small percentage of lithium-ion vehicle batteries are recycled today, and the majority of the processes used to do so are not automated, said Tim McIntyre, principal investigator in ORNL's Electrification ???



Lithium-ion (Li-ion) batteries are commonly used in portable electronic devices such as smartphones, laptops, and electric vehicles. However, at the end of their lifespan, these batteries need to be properly disposed of and recycled or refurbished to avoid environmental and safety hazards. Step 3: Disassembly. The Li-ion battery should be



Increasing numbers of lithium-ion batteries for new energy vehicles that have been retired pose a threat to the ecological environment, making their disassembly and recycling methods a research priority. Due to the variation in models and service procedures, numerous lithium-ion battery brands, models, and retirement states exist. This uncertainty contributes to ???

# LITHIUM ION BATTERY DISASSEMBLY



Lithium-Ion Battery Recycling Overview of Techniques and Trends Cite This: ACS Energy Lett. 2022, 7, 71277719 Read Online batteries into new ones are also likely to require battery disassembly, since many of the failure mechanisms for LIB require replacement of battery components. Reuse of LIB in



The battery pack used in Figure 3 is typical of that found in many other battery-operated devices. It consists of several battery cells connected in series plus a Battery Management System (BMS) PCB. This is the circuit board shown in Figures 3b and 3c. The latter image also shows a size comparison between the new cells and those in the old battery pack.



**2.2. Disassembly Process of Lithium-Ion Traction Batteries** The disassembly of lithium-ion traction batteries after reaching their end-of-life (EoL) represents a promising approach to maximize the purity of the segregated material [5]. The research topic of disassembly is, therefore, also increasingly addressed in research in terms



# LITHIUM ION BATTERY DISASSEMBLY



Retired electric-vehicle lithium-ion battery (EV-LIB) packs pose severe environmental hazards. Efficient recovery of these spent batteries is a significant way to achieve closed-loop lifecycle management and a green circular economy. More specifically, a) disassembly target detection recognizes the type and state of the object to be



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Manual disassembly of the lithium-ion battery (LIB) modules of electric vehicles (EVs) for recycling is time-consuming, expensive, and dangerous for technicians or workers. Dangers associated with high voltage and thermal runaway make a robotic system suitable for the automated or semi-automated disassembly of EV batteries. In this paper, we explore battery ???

# LITHIUM ION BATTERY DISASSEMBLY



The central components of the automated disassembly comprise of the automated detection and pose estimation of components. Based on this, the derivation of goal positions of the robot end effector (EEF) for disassembly ???



??? Work on a lithium battery should be carried out by qualified personnel only. 1.1. General warnings  
??? While working on a lithium battery, wear protective eyeglasses and clothing. ??? Any leaked battery material, such as electrolyte or powder on the skin or the eyes, must immediately be flushed with plenty of clean water.

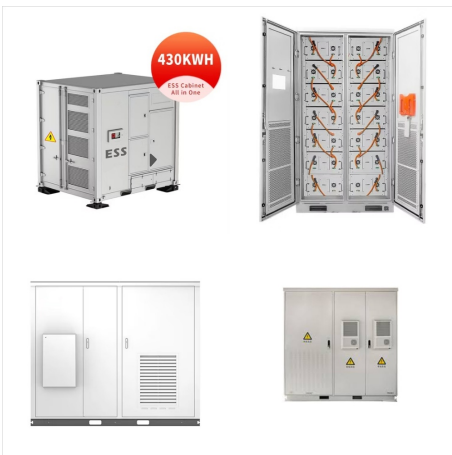


Lithium-ion batteries (LIBs) are one of the most popular energy storage systems. Due to their excellent performance, they are widely used in portable consumer electronics and electric vehicles (EVs).

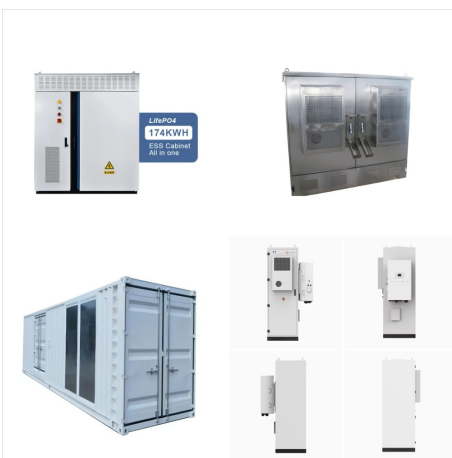
# LITHIUM ION BATTERY DISASSEMBLY



As we navigate the climate crisis and move towards increased use of Lithium-Ion Batteries (LIBs) in transportation, which still encompassed 28 % of global greenhouse gas emissions in 2021 (US EPA, 2023), it is critical to develop efficient and economically viable recycling solutions. LIB recycling primarily involves pyrometallurgy, hydrometallurgy, or a ???



Abstract. Electric vehicle production is subjected to high manufacturing cost and environmental impact. Disassembling and remanufacturing the lithium-ion power packs can highly promote electric vehicle market penetration by procuring and regrouping reusable modules as stationary energy storage devices and cut life-cycle cost and environmental impact. ???



The disassembly of lithium ion battery modules, albeit manually at present, has been shown to produce a high yield (ca. 80%) of total mass recovered in a purer state that was possible using ???

# LITHIUM ION BATTERY DISASSEMBLY



As the market share of electric vehicles continues to rise, the number of battery systems that are retired after their service life in the vehicle will also increase. This large growth in battery returns will also have a noticeable impact on processes such as battery disassembly. The purpose of this paper is, therefore, to examine the challenges of the battery disassembly ???



Small battery means a lithium metal battery or lithium ion battery with a gross mass of not more than 12 kg. Small cell means a lithium metal cell in which the lithium content of the anode, when fully charged, is not more than 12 g, or in the case of a lithium ion cell, means a cell with a Watt-hour rating of not more than 150 Wh.



From their initial discovery in the 1970s through the awarding of the Nobel Prize in 2019, the use of lithium-ion batteries (LIBs) has increased exponentially. in Europe) has significantly lower transit costs. On the other ???



# LITHIUM ION BATTERY DISASSEMBLY



Processes for dismantling and recycling lithium-ion battery packs from scrap electric vehicles are outlined. Disassembly of battery packs from automotive applications requires high-voltage



Lithium-ion batteries (LIBs) are one of the most popular energy storage systems. Due to their excellent performance, they are widely used in portable consumer electronics and electric vehicles (EVs). This paper is devoted to module-to-cell disassembly, discharge state characterization measurements, and material analysis of its components



4 | Page Be sure to read all documentation supplied with your battery. Never burn, overheat, disassemble, short-circuit, solder, puncture, crush or otherwise mutilate battery packs or cells. Do not put batteries in contact with conductive materials, water, seawater, strong oxidizers and strong acids. Avoid excessively hot and humid conditions, especially when batteries are fully charged.

# LITHIUM ION BATTERY DISASSEMBLY



From their initial discovery in the 1970s through the awarding of the Nobel Prize in 2019, the use of lithium-ion batteries (LIBs) has increased exponentially. in Europe) has significantly lower transit costs. On the other hand, battery disassembly costs can make up 2???17% of battery recycling costs; since disassembly costs depend strongly