



Li-ion Battery Recycling Technology to Boost Circular Economy

Why in News?

The **Ministry of Electronics and Information Technology (MeitY)** in India has taken a significant step towards promoting a [circular economy](#) by transferring a **cost-effective Li-ion battery recycling technology** to nine recycling industries and start-ups.

- The technology was developed under the "**Centre of Excellence on E-waste management**" at the **Centre for Materials for Electronics Technology (C-MET), Hyderabad**, in collaboration with the **Government of Telangana** and industry partner **M/s Greenko Energies Pvt. Ltd., Hyderabad**.
- This initiative is part of the [Mission Lifestyle for the Environment \(LiFE\)](#) under the "**Promote circularity campaign.**"

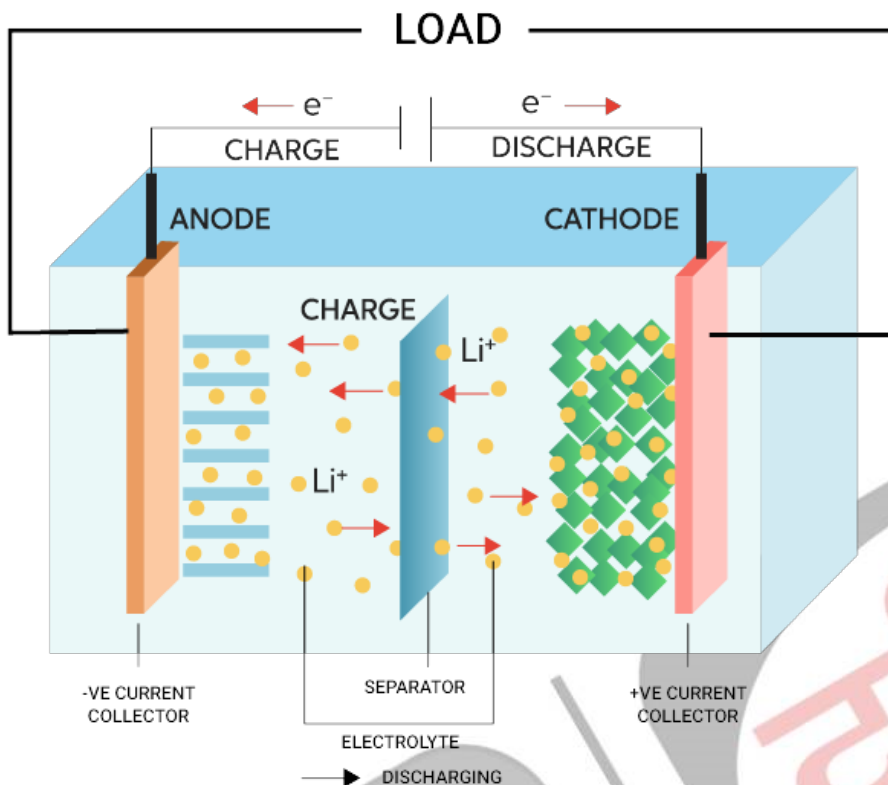
What is the Recently Invented Recycling Technology?

- The recycling technology for Li-ion batteries is designed to efficiently process and recover valuable materials from discarded batteries.
- The process begins by **soaking the batteries in a solution** to **extract** the valuable metals.
 - The solution aids in the separation and extraction of **metals** such as **Lithium (Li)**, Cobalt (Co), Manganese (Mn), and **Nickel (Ni)**, enabling the recovery of over **95% of their contents in the form of corresponding oxides/carbonates with a purity of approximately 98%**.
- These metals are then transformed into their pure forms, **ready to be reused in making new batteries or other useful applications**.
- This technology ensures that **over 95% of these valuable metals are recovered from batteries**.
- By recycling the batteries, we can reduce the need for mining new resources and contribute to a more sustainable environment.
- The recycling technology for Li-ion batteries plays a crucial role in promoting a **circular economy**.

What is a Li-ion Battery?

- **About:**
 - A lithium-ion (Li-ion) battery is a type of **rechargeable battery**.
 - Li-ion batteries use an intercalated (Intercalation is the reversible inclusion or insertion of a molecule into materials with layered structures) **lithium compound as one electrode material, compared to the metallic lithium used in a non-rechargeable lithium battery**.
 - The battery consists of an **electrolyte, which allows for ionic movement**, and the two electrodes are the constituent components of a lithium-ion battery cell.
 - **Lithium ions** move from the **negative electrode** to the **positive electrode** during **discharge and back when charging**.

COMPONENTS OF LITHIUM-ION BATTERY



▪ Applications:

- Electronic gadgets, Tele-communication, Aerospace, Industrial applications.
- Lithium-ion battery technology has made it the favourite power source for electric and hybrid electric vehicles.

▪ Disadvantages of Li-ion Batteries:

- Long charging times.
- Safety issues as instances of batteries catching fires have been there.
- Expensive to manufacture.
- While the Li-ion batteries are seen as sufficiently efficient for applications such as phones and laptops, in case of EVs, these cells still lack the range that would make them a viable alternative to internal combustion engines.

What is Lithium?

▪ About:

- Lithium (Li), sometimes also referred as **'White gold'** due to its high demand for rechargeable batteries, is a soft and silvery-white metal.

▪ Extraction:

- Lithium can be extracted in different ways, depending on the type of the deposit — generally either through **solar evaporation of large brine pools**, or from **hard-rock extraction of the ore**.

▪ Uses:

- Lithium is an important component of **electrochemical cells** used in batteries of EVs, Laptops, Mobiles etc.
- It is also used in **thermonuclear reactions**.

- **It is used to make alloys** with aluminium and magnesium, improving their strength and making them lighter.
 - **Magnesium-lithium alloy** - for **armour plating**.
 - **Aluminum-lithium alloys** - in **aircraft, bicycle frames and high-speed trains**.
- **Major Global Lithium Reserves:**
 - Chile > Australia > Argentina are top countries with Li reserves.
 - [Lithium Triangle](#): **Chile, Argentina, Bolivia**.
- **Lithium Reserves in India:**
 - Preliminary survey showed estimated lithium reserves of 14,100 tonnes in a small patch of land surveyed in **Southern Karnataka's Mandya district**.
 - Other **potential sites**:
 - Mica belts in **Rajasthan, Bihar, Andhra Pradesh**.
 - Pegmatite belts in **Odisha** and **Chhattisgarh**.
 - **Rann of Kutch** in Gujrat.

UPSC Civil Services Examination, Previous Year Question (PYQ)

Q. Which one of the following pairs of metals constitutes the lightest metal and the heaviest metal, respectively? (2008)

- (a) Lithium and mercury
- (b) Lithium and osmium
- (c) Aluminium and osmium
- (d) Aluminium and mercury

Ans: (b)

Exp:

- Light metals are metals of low atomic weight while heavier elements generally have high atomic weight.
- Osmium is a hard metallic element which has the greatest density of all known elements. Osmium has an atomic weight of 190.2 u and its atomic number is 76.
- Lithium having an atomic number 3 and atomic weight of 6.941u is the lightest known metal.
- **Therefore, option (b) is the correct answer.**

Source: PIB

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