

THE EXCITEMENT OVER THE LITHIUM FIND IN KASHMIR

Business Line

Paper - III
(Indian Economy)

A sense of euphoria has engulfed the country – quite understandably – after the Ministry of Mines announced on Friday that the Geological Survey of India has discovered lithium in Kashmir, with inferred reserves of 5.9 million tonnes (mt). Lithium is the primary ingredient for making the most sought-after electrochemical batteries, viz., lithium-ion batteries.

Why is this latest discovery important?

There are other electrochemical batteries blossoming in research laboratories, such as those based on zinc, sodium and iron, and indeed, there are many other ways of storing energy—ranging from flow batteries to pumped storage—but there is no denying that today, lithium is the king.

What is Lithium?

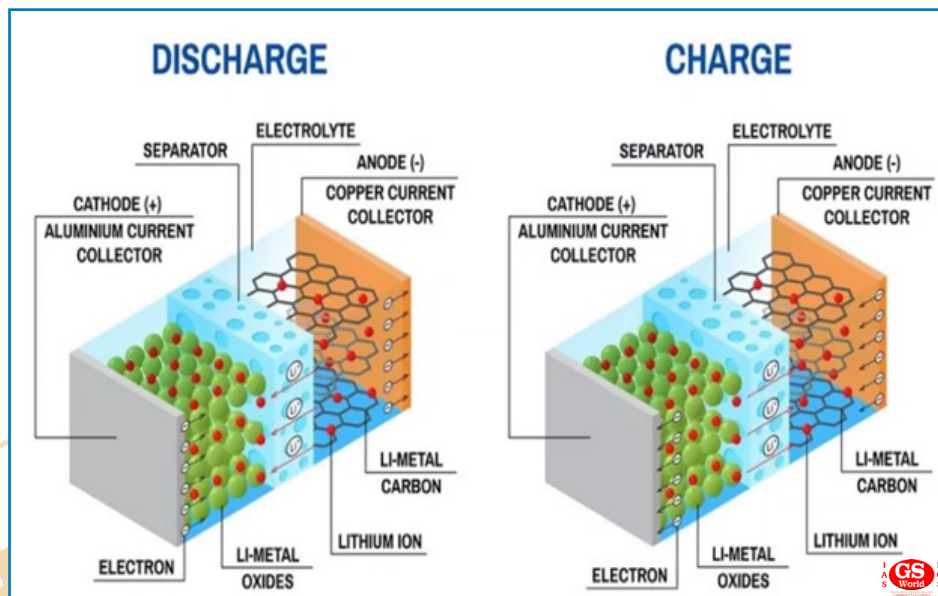
Lithium is a metal: the lightest metal and the third element in the periodic table, after hydrogen and helium, both of which are gasses. It is highly reactive. If you put a pellet of lithium in water, it will start sizzling like pakora in hot edible oil and could even catch fire. It is extremely light and a good donor of electrons—which makes it the preferred electrode material in batteries. But to make better batteries, lithium is mixed with other elements, such as cobalt, iron, phosphorus or sulphur: but it remains the main stuff in lithium-ion batteries

5 Types of Lithium-Ion Batteries

<p>Lithium-Cobalt Oxide Battery</p> <ul style="list-style-type: none"> Used mostly in handheld electronics (Cell phones, Laptops and Cameras) Risky specially when damaged Cobalt is scarce and expensive Low discharge rates Highest energy density (110-190) Wh/kg 		<p>Lithium-Nickel Manganese Cobalt Oxide Battery</p> <ul style="list-style-type: none"> Longer life and inherent safety Cobalt is scarce and expensive Less prone to heating Used in Power tools, e-bikes and electric power trains Lower energy density (95-130) Wh/kg
<p>Lithium-Titanate Battery</p> <ul style="list-style-type: none"> Can operate at very low temp (-40°C) Rapid charge and discharge Used in Mitsubishi i-MiEV Lower inherent voltage 2.4 V (compared to 3.7 V) Lower energy density (30-110) Wh/kg 	<p>Lithium-Iron Phosphate Battery</p> <ul style="list-style-type: none"> Dramatically reduces the risks of overheating and fire. Offers much less volumetric capacity Used in power tools and medical equipment Longer-life and inherently safe Lower Energy Density (95-140) Wh/kg 	<p>Lithium-Manganese Oxide Battery</p> <ul style="list-style-type: none"> Lower cost Longer life and inherently safe Used in Hybrid Vehicles, Cell phones, Laptops High discharge rates Lower energy density (110-120) Wh/kg

How much lithium is being imported?

In 2020-21, ₹173 crore worth of lithium metal and ₹8,811 crore worth of lithium batteries were imported. In the April – November period of 2022, for which figures are available, the numbers were ₹164 crore and ₹7,986 crore. In the same period, India also imported ₹339 crore worth of lithium hydroxide and ₹95 crore of lithium carbonate, both of which doubled over the corresponding period of the



previous year. This gives a sense of buoyancy in imports. These numbers will only increase, exponentially, as (according to Niti Aayog) the demand for advanced chemistry cell batteries is set to increase between 104 GWhr and 260 GWhr by 2030, compared with about 3 GWhr now.

Lithium reserves in India and the world

The Ministry of Mines has estimated that the reserves could contain 5.9 mt of lithium. To compare, the previous discovery in India, in the Mandya district of Karnataka in 2021, was estimated at 1,600 tons. To put this in perspective, Bolivia has 21 mt, Argentina 17 mt, Chile 9 mt, US 6.8 mt, Australia 6.3 mt, and China 4.5 mt.

However, the 5.9 mt estimate of the Kashmir find is only in the ‘inferred’ category. A lot of work needs to be done before it is established as mineable reserves. The GSI survey was a ‘preliminary survey’ (or, ‘G3’), which is the second step in the exploration of minerals after ‘reconnaissance surveys (G4)’. After further exploration, the exact reserves will be determined and then will start the process of securing environmental clearances and tendering out for mining. Hopefully, as all this happens, a processing industry will evolve in India.

How long will it take for Kashmir lithium to get into products?

A highly optimistic estimate would be seven years, but ten years looks feasible. In the meantime, India has to do with imports. Fortunately, under the Indo-Australia FTA, lithium can be imported duty-free.

Lithium-ion battery (or LIB)

- Lithium ion battery is a re-chargeable battery. When the battery is discharged, lithium ions flow from its negative terminal to the positive terminal and vice versa when the battery is charged. These batteries are frequently used in today's consumer electronics and are one of the most popular rechargeable batteries for portable electronic devices.
- A 'lithium-ion battery' or 'Li-ion' battery is a type of rechargeable battery.
- A Li-ion battery uses an encapsulated lithium compound as the electrode material, while a non-rechargeable lithium battery uses metallic lithium. Intercalation refers to the reversible incorporation or insertion of a molecule into materials having a layered structure.
- The electrolyte in the battery consists of two electrodes. The electrolyte causes the ions to move, while the electrodes are the components of a lithium-ion battery cell. Lithium ions move from the negative electrode to the positive electrode during battery discharge, while in the opposite direction when charging.

Lithium-ion battery usage:

Electronic equipment, tele-communication, aerospace, industrial applications. Lithium-ion battery technology has become the preferred energy source for electric and hybrid electric vehicles.

Drawbacks of Lithium-Ion Battery:

- Long charging times, low power density, occasional fire incidents with these batteries also pose safety concerns, and expensive manufacturing process.
- Lithium-ion batteries are considered efficient enough for applications such as phones and laptops, but the technology has not improved enough in terms of battery range (the maximum distance a battery can travel on a single charge) in the case of electric vehicles. making them an affordable alternative to vehicles with internal combustion engines.

Geological Survey of India

- The Geological Survey of India (GSI) department was established in the year 1851 mainly for the purpose of exploration of coal reserves available in India for railways. Over the years, this institution has not only developed into a repository of essential geological information for various fields in the country, but has also attained the status of a geological organization establishing its identity at the international level.
- The main function of GSI is to carry out work related to National Geological Information and Mineral Resource Assessment and Modernization. It is headquartered in Kolkata and has state unit offices in almost all the states of the country and six regional offices located at Lucknow, Jaipur, Nagpur, Hyderabad, Shillong and Kolkata.
- At present the Geological Survey of India is functioning as a subsidiary body of the Ministry of Mines.

Expected Question

Que. Consider the following statements-

1. Only lithium is used to make Lithium-ion batteries.
2. Lithium-ion battery is a rechargeable battery. When the battery is discharged, lithium ions flow from its negative terminal to the positive terminal and vice versa when the battery is charged.

Which of the statements given above is/are correct?

- (a) Only 1
- (b) Only 2
- (c) Both 1 and 2
- (d) Neither 1 nor 2

Answer : B

Mains Expected Question & Format

Que.: What is lithium? Why is this important for India? Throw light on the importance and disadvantages of lithium ion batteries.

Answer Format :

- ❖ Write about lithium.
- ❖ Explain how it can be important for India.
- ❖ Explain the uses and disadvantages of lithium ion batteries.
- ❖ Give a balanced conclusion keeping in view its need at present.

Note: - The question of the main examination given for practice is designed keeping in mind the upcoming UPSC mains examination. Therefore, to get an answer to this question, you can take the help of this source as well as other sources related to this topic.