



What minerals do EV batteries need?

EV batteries need more of certain "critical minerals." The top five for lithium-ion batteries are lithium, nickel, cobalt, manganese, and graphite. There currently aren't enough operational mines for these critical minerals for a robust EV battery supply chain. We also need to expand critical mineral processing and recycling capacity.

What materials are needed to make lithium ion batteries?

There are seven main raw materials needed to make lithium-ion batteries. Among these, the US defines graphite, lithium, nickel, manganese, and cobalt as critical minerals: metals of essential importance to US energy needs, but which have supply chains vulnerable to disruption.

Can graphite be used in lithium ion batteries?

Graphite is currently widely used as the anode in lithium-ion batteries. These EV battery chemistries depend on five critical minerals whose domestic supply is potentially at risk for disruption: lithium, cobalt, manganese, nickel, and graphite.

What are the top 5 lithium-ion batteries?

The top five for lithium-ion batteries are lithium, nickel, cobalt, manganese, and graphite. There currently aren't enough operational mines for these critical minerals for a robust EV battery supply chain. We also need to expand critical mineral processing and recycling capacity. We also need to diversify our critical minerals sources.

How much minerals are in a battery?

(This article first appeared in the Visual Capitalist Elements) The cells in the average battery with a 60 kilowatt-hour (kWh) capacity contained roughly 185 kilograms of minerals.

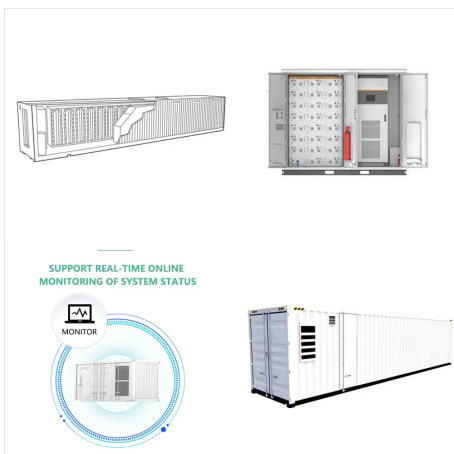
Which mineral is used in EV battery recycling?

Graphite, the mineral used in the anode, follows the cathode minerals. The subsection "Secondary Mineral Supply" discusses EV battery recycling as a potential supply option available for the five minerals. Each mineral subheading contains information on the element's mineralization and geologic formation.

# MINERALS NEEDED FOR LITHIUM BATTERIES



Amounts vary depending on the battery type and model of vehicle, but a single car lithium-ion battery pack (of a type known as NMC532) could contain around 8 kg of lithium, 35 kg of nickel, 20 kg



In 2035 over a fifth of the lithium and nickel, and 65% of the cobalt, needed to make a new battery could come from recycling. Europe will likely produce enough batteries to supply its own EV

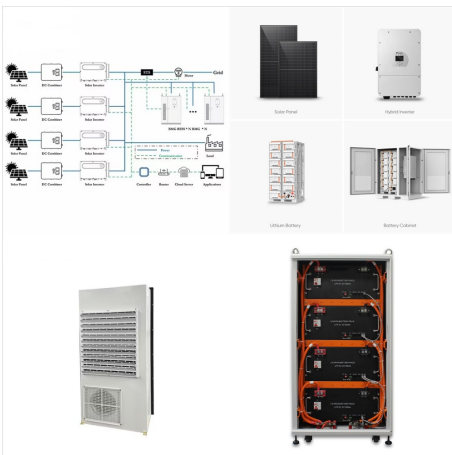


Mines extract raw materials; for batteries, these raw materials typically contain lithium, cobalt, manganese, nickel, and graphite. The "upstream" portion of the EV battery supply chain, which refers to the extraction of the minerals needed to build batteries, has garnered considerable attention, and for good reason.. Many worry that we won't extract these minerals ???

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This is a paradigm-shifting breakthrough, as Pure Lithium is the key prerequisite for Lithium-air batteries, which are considered the holy grail of all EV battery technologies, as a Lithium-air battery the size of a small backpack can power an EV for around 1000 Kilometers on a single charge. 9. Gold: The Unsung Hero in Electronics



For example, the average 60 kilowatt-hour (kWh) battery pack???the same size that's used in a Chevy Bolt???alone contains roughly 185 kilograms of minerals, or about 10 times as much as in a typical car battery (18 kg). Lithium, nickel, cobalt, manganese, and graphite are all crucial to battery performance, longevity, and energy density.



The different Tesla batteries feature cathodes with varying material makeups. The 18650-type battery is a Nickel-Cobalt-Aluminum (NCA) lithium-ion battery, meaning that these are the materials used to produce its cathodes. The 2170-type battery is either a NCA or a Nickel-Cobalt-Manganese (NCM) battery, depending on where it is manufactured.

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Battery minerals???in particular, cobalt and lithium???are facing increased demand, shifts in supply chain dynamics, and a potential global shortage driven by the energy transition and growing electric vehicle use. Demand for lithium-ion ???



Lithium, cobalt and nickel???key minerals used to make the lithium-ion batteries used in electric vehicles (EVs)???are of principal concern, based on research Earthworks commissioned from the Institute for Sustainable Futures at the University of Technology Sydney. The skyrocketing demand for these minerals is driving the expansion of mining



Lithium (Li) ore is a type of rock or mineral that contains significant concentrations of lithium, a soft, silver-white alkali metal with the atomic number 3 and symbol Li on the periodic table. Lithium is known for its unique properties, such as being the lightest metal, having the highest electrochemical potential, and being highly reactive with water.



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Lithium is the core component of the most popular battery technology: lithium-ion batteries. This means electric vehicles and stationary batteries are highly reliant on this material. The second most popular technology ??? lithium iron phosphate (LFP) ??? also uses lithium, so the most likely alternative will still need large amounts of lithium.



Only one U.S. company, Retriev Technologies Inc 34, 35. recycles lithium metal and lithium-ion batteries at its facilities in British Columbia and Lancaster, Ohio., The Battery and Critical Mineral Recycling Act of 2020 and the Department of Energy's Lithium-Ion Battery Recycling Prize of 2019 aim to improve recycling R& D and incentivize



We examine the relationship between electric vehicle battery chemistry and supply chain disruption vulnerability for four critical minerals: lithium, cobalt, nickel, and manganese. We compare the

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But the supply of some minerals, such as lithium, would need to rise by up to one-third by 2030 to satisfy the pledges and announcements for EV batteries in the "announced pledges scenario (APS



Lithium iron phosphate batteries don't contain any cobalt, and they've grown from a small fraction of EV batteries to about 30% of the market in just a few years. Low-cobalt options have also



transition. Lithium hydroxide is better suited than lithium carbonate for the next generation of electric vehicle (EV) batteries. Batteries with nickel???manganese???cobalt NMC 811 cathodes and other nickel-rich batteries require lithium hydroxide. Lithium iron phosphate cathode production requires lithium carbonate. It is likely both will be

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Batteries are devices that store chemical energy and convert it to electrical energy. The three most common types of batteries are lead-acid, nickel-cadmium (NiCd), and lithium-ion (Li-ion). Batteries contain several minerals, including lead, sulfuric acid, cadmium, cobalt, manganese dioxide, lithium oxide, and carbon.



Depending on what those three parts are made of, batteries require different minerals. Many EVs still use lead-acid batteries, which use lead and sulfuric acid, but lithium-ion batteries (LIBs) are expected to rapidly take over the market, so demand for lead-acid batteries won't grow much.



2. Overview of Battery Technology in EVs. Most electric vehicles today use lithium-ion batteries, known for their high energy density and efficiency. While some innovations, such as solid-state batteries, are on the horizon, lithium-ion remains the most widely used technology due to its performance benefits and relative maturity.

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Over the past 10 years, DOE-funded research has helped reduce the cost of lithium-ion batteries by 80 percent, lowering the cost of electric vehicle battery packs to \$185/kWh. While battery materials recycling is improving, battery technology cost and performance needs to be improved.



To further accelerate efforts to secure the supply chain for the critical minerals and materials needed for advanced batteries, this Initiative will coordinate White House and agency attention to



One aspect of the bill was setting a market value-based target for battery-critical mineral content in electric vehicles (EVs). a non-FTP country that provided 59 percent of the 2,618 tons of lithium mineral the US imported in 2019. "As engineers, when we design materials for batteries or anything else, we need to think about where



# MINERALS NEEDED FOR LITHIUM BATTERIES



End-of-life lithium-ion batteries contain valuable critical minerals needed in the production of new batteries. Clean energy technologies like renewable energy storage systems and electric vehicle batteries will demand large amounts of these minerals, and recycling used lithium-ion batteries could help meet that demand.



The vast majority of EVs use lithium-ion (Li-ion) batteries, which harness the properties of minerals and elements to power the vehicles. But batteries do not grow on trees???the raw materials for