Mastering EV Battery Chemistry 101: Two Important Investing Guides

With the United States having the CHIPS Act, and China, Russia, Saudi Arabia, Australia, several African countries, and Canada holding the majority of natural resources, it becomes clear that the green transition is not a simple snap-your-fingers affair. The vision of everyone driving electric vehicles with a “Tesla Solar Roof” on their homes is not an overnight reality. Nevertheless, the widespread adoption of Zero Emission Vehicles (ZEV) will undoubtedly lead to a high demand for critical materials, including Cobalt, Copper, Graphite, Iridium, Lithium, Manganese, Nickel, Platinum, and other selected rare earth elements.

You might be wondering, in terms of battery cathodes, the most commonly used chemistries are Nickel Cobalt Aluminum Oxides (NCA), Nickel Manganese Cobalt Oxides (NMC), and Lithium Iron Phosphate (LFP). NMC and LFP-based batteries are expected to dominate in this decade. As technology advances, emerging technologies such as sodium-ion batteries could potentially disrupt the EV battery market by providing a more cost-effective and abundant alternative, potentially replacing critical materials like Cobalt and Lithium.

Here’s the thing: before rushing to invest in these critical materials for the green transition, it is imperative and crucial to understand electric vehicle (EV) battery chemistry. The most common chemistry mixes in EV batteries include the following:

1. Lithium Iron Phosphate (LFP)
2. Lithium Manganese Oxide (LMO)
3. Nickel Cobalt Aluminum Oxide (NCA92)
4. Nickel Cobalt Aluminum Oxide (NCA 90)
5. Nickel Manganese Cobalt oxides (NMC)
6. NMC 811
7. NMC 622
8. NMC 532
9. NMC 111

Lithium Iron Phosphate (LFP):

Introduced in 1996 to address the low-cycle life of LMO and LCO-based batteries, LFP cathodes are primarily used in lower-priced, entry-level EV models due to their lower manufacturing cost.

Advantages:

- High cycle-life of 4,000 cycles
- C-rate of 2/5 or higher

- High thermal stability
- Can withstand mechanical disturbances.
- Lower thermal runaway risk

Disadvantages:

- Lower efficiency at extreme temperatures
- Lower energy density (up to 160Wh/kg)
- Limited driving range

Lithium Manganese Oxide (LMO):

Launched in the mid-90s as an alternative to LCOs, LMO cathodes offer lower internal resistance, great thermal stability, and higher current levels.

Advantages:

- Lower internal resistance
- Excellent thermal stability with reduced overheating risk
- Higher current levels
- Higher C-rate

Disadvantages:

- Low cycle life (1,000-2,000 cycles)
- Not ideal for longer applications

Nickel Manganese Cobalt Oxides (NMC 811, NMC 622, NMC 532, NMC 111):

NMC is the most common cathode material in today’s EV batteries, offering higher energy densities than its predecessors. NMC cathodes consist of Nickel, Manganese, and Cobalt in different compositions.

NMC 811: 80% Nickel, 10% Manganese, 10% Cobalt

NMC 622: 60% Nickel, 20% Manganese, 20% Cobalt

NMC 532: 50% Nickel, 30% Manganese, 20% Cobalt

NMC 111: 33% Nickel, 33% Manganese, 33% Cobalt

Advantages:

- Higher energy density,
- Thermal stability
- Nominal voltage of 3.7V
- Decent cycle life of 2,000 cycles
- Good charging performance (C-rate of 1/3)

Disadvantages:

- Shorter life cycle
- The use of expensive materials

Nickel Cobalt Aluminum Oxides (NCA 92, NCA 90):

NCA offers higher energy density than other composites, such as NMC. It comes in two compositions: NCA 92 and NCA 90.

NCA 92: Lithium, Nickel, Cobalt, Aluminum

NCA 90: Lithium, Nickel, Cobalt, Aluminum

Advantages:

- High energy density

- Good charging performance
- No use of unsustainable manganese

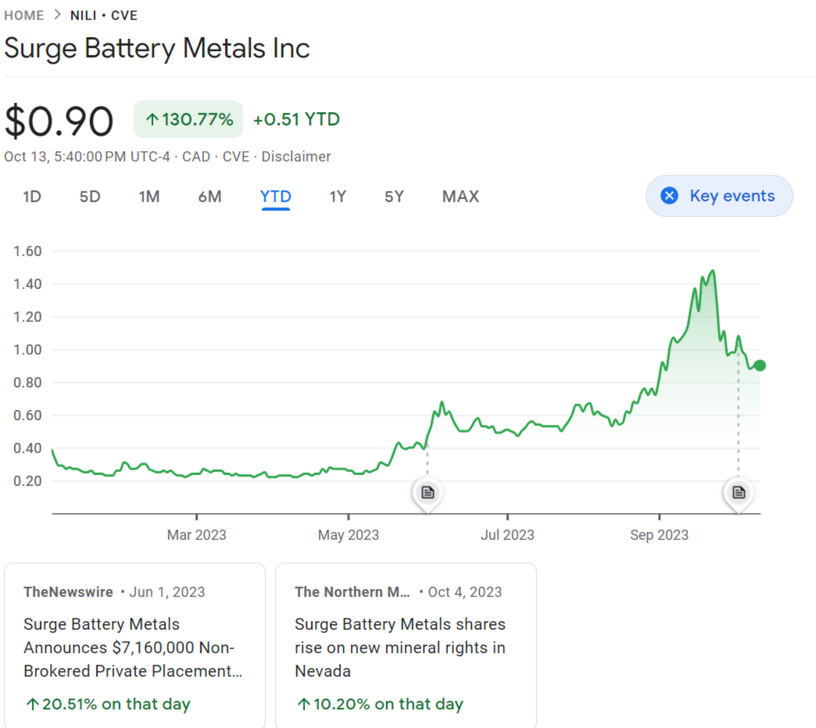
Disadvantages:

- Low cycle life (about 1,000 cycles)
- High thermal runaway risk
- Unsustainable (expensive materials)

While Lithium-ion batteries currently dominate the EV industry, advancements in critical components have a significant influence on material demand. For instance, graphite-based anodes hold a 70% market share due to their established performance reputation. In this ever-evolving EV landscape, with the growing demand for critical elements, it’s essential for investors to be fully aware of the market demand for these materials and the future market characteristics before investing in any green transition minerals.

MY CURRENT GUIDING PRINCIPLES…YES, MY TWO IMPORTANT INVESTING GUIDES:**

Personally, I look out for Nickel, Copper, and Lithium projects that are possibly owned and controlled on private land (Rule #1). For instance, consider Surge Battery Metals ($NILI) as an example.

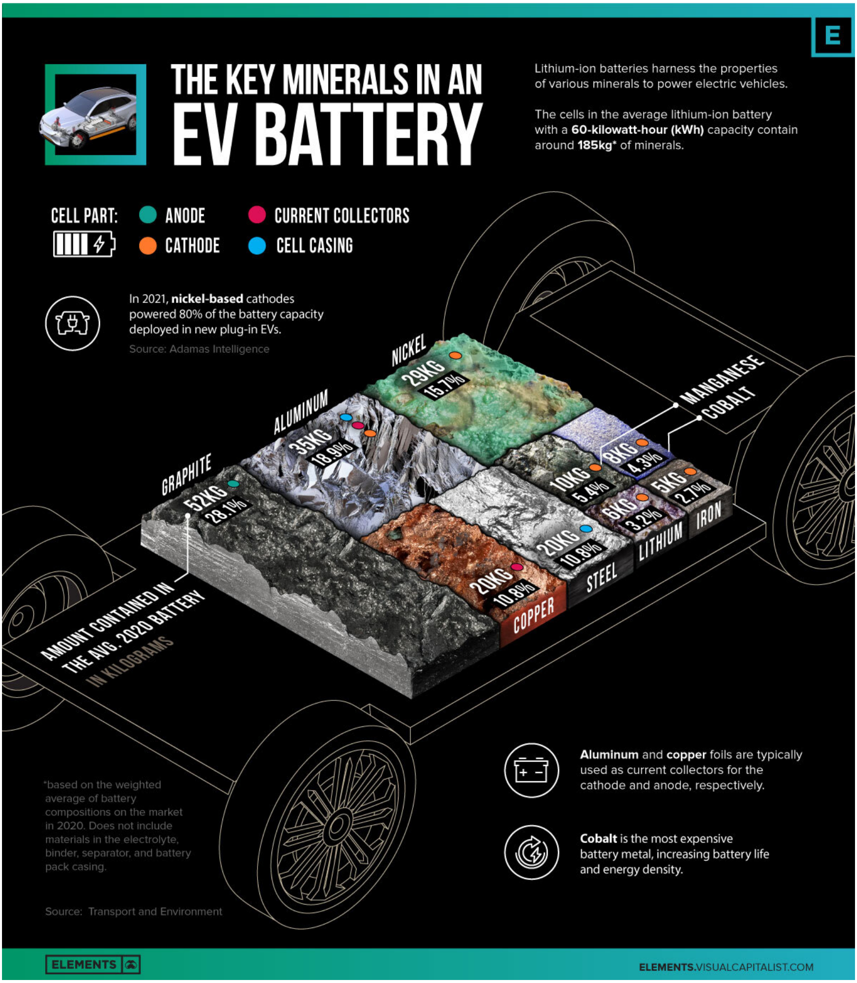


Source: Google Stock Chart, Surge Battery Metals Inc

As soon as my proprietary notification

gave me the signal on June 6, 2023, along with other fundamental factors, I quickly conducted some research on "***SedarPlus,***" and I was all in on Surge Battery Metals, riding it from 0.54c to $1.32 for a 144.4% gain. I'm still considering trading back in for the tax-loss selling season. Without seeing that land is privately owned, I tend to be more cautious with my investments.

Secondly (Rule #2), keep an eye out for new EV battery chemistries, as there's always something new, and auto manufacturers are continually seeking the most cost-effective and range-maximizing options for EV batteries. As soon as I post this mini thought, it might already become obsolete.



[Source: Visual Capitalist]