About Globe

- Globe Metals & Mining Limited is a Perth based company listed on Australian Stock Exchange (ASX Code: GBE)

Investment Summary

- 100% interest held in Kanyika Niobium Project in Malawi (Africa)

Directors and Management

Ms Alice Wong - Non-Executive Chairperson
Mr Ricky Lau – Non-executive Director
Mr Bo Tan - Non-executive Director
Mr Michael Barrett - Non-executive Director
Mr Michael Choi - Non-executive Director
Mr Grant Hudson – Chief Executive Officer
Mr Paul Hardie – Company Secretary
Mr Michael Fry – Chief Financial Officer

Capital Structure

Shares on Issue: 482,320,039
Options on Issue: 5,000,000 Options (exercisable at $0.13; expiry 30 Jun 2026)

Substantial Shareholders

Apollo Metals: 51.00%
Ao-Zhong International Minerals: 24.49%

Director Holdings*

Ms Alice Wong: 245,983,611 (51.0%)
Mr Bo Tan: 16,397,666 (3.40%)
** both direct and indirect*

Contact

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Chief Executive Officer
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Niobium

Critical EV Battery Metal

Globe Metals & Mining Limited (ASX: **GBE**, **Globe** or the **Company**) hereby a provides information in relation to the critical use of Niobium in the manufacture of EV batteries and in batteries for a range of applications including power tools, home appliances, energy storage and industrial robots.

Niobium is the primary metal contained at Globe's Kanyika Project in Malawi.

Authorisation for Release

This presentation has been authorised for release by the Company's Chief Executive Officer, Grant Hudson.

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Niobium

Solving the requirement for faster-charging, safer, lighter EV batteries

Poised to play key role in EV battery progression with significant growth in demand predicted

Introduction

Consumption of niobium oxides and metal powders is projected to grow rapidly over the next decade due to its growing application in electric vehicles and in a range of other technological areas.

Sales of niobium oxide, used in e-batteries, is expected to grow from 100 tons (in 2021) to ~45,000 tons (by 2030), or to US$1.8Bn per annum.[1]

Ferro-Niobium (FeNb) used in the production of High Strength Low Alloy (HSLA) Steels is a US$1.4Bn per annum Global Market expected to grow at 5.6% CAGR to 2030.

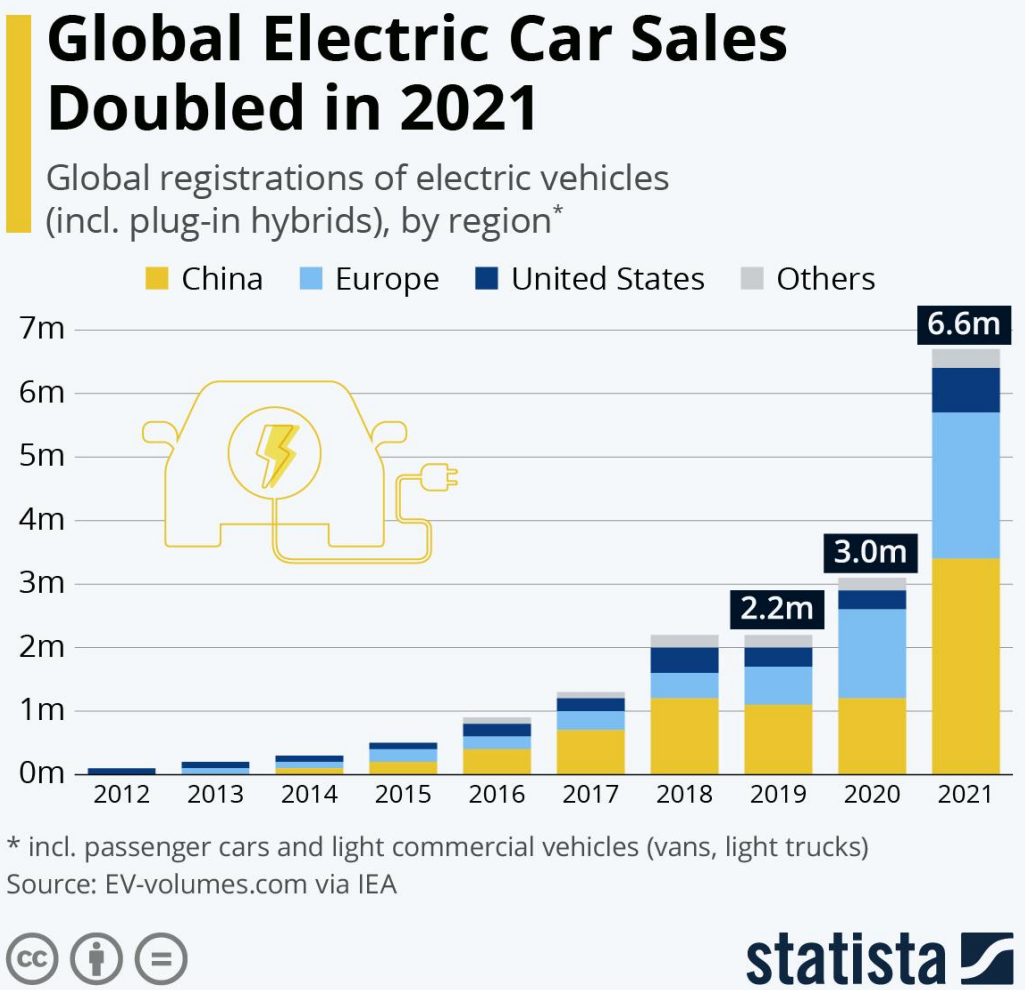
Globe Metals will look to manufacture high grade niobium oxides and powders and be only the second vertically-integrated supplier.

1 Internal Globe estimate based on current value of niobium oxide, CBMM production capacity and estimated market share of CBMM at full production


Globe
Metals & Mining
BOLT EV
BOLT EV
evgo.com

The EV evolution: only getting started

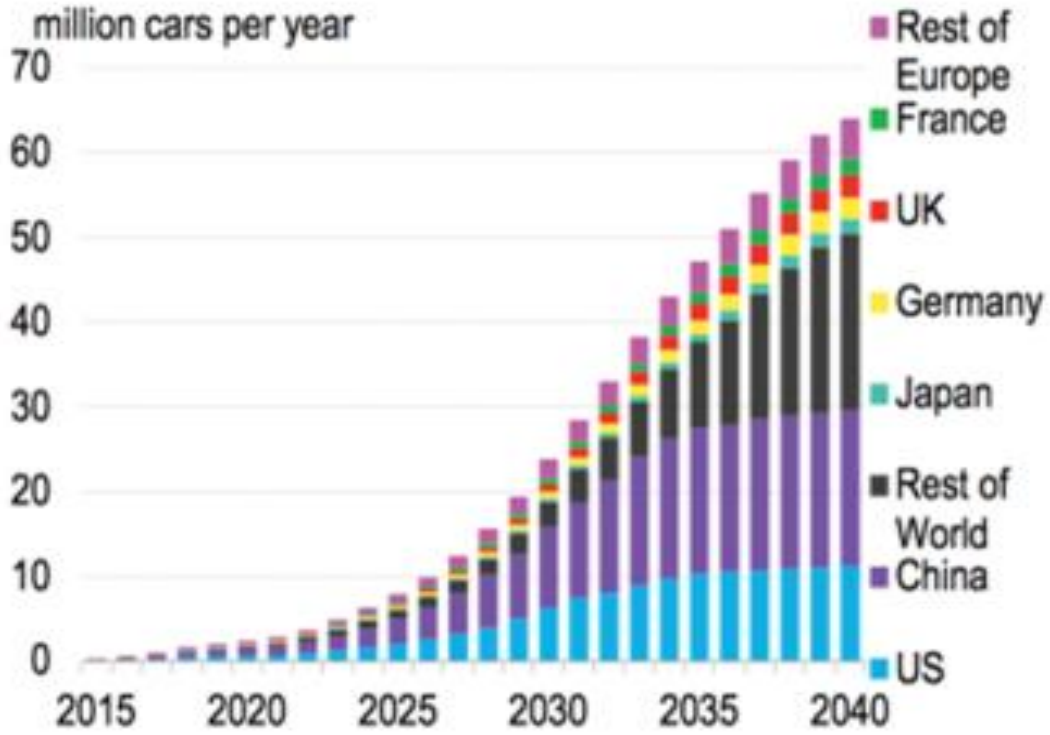
- It may seem like electric and electrified cars are everywhere, but in the grand scheme of things we're only just getting started.
- If you look at global auto sales as one big pie, EVs right now are only a tiny sliver, making up just **2% of sales**.
- EVs simply offer a better driving and ownership experience. EVs are quieter, smoother and, with many fewer moving parts, more reliable and near maintenance-free.
- With energy prices as they are, the cost of fuel for an average sized SUV is more than three times more expensive than electricity. Some adopters of EV fleets are currently seeing a 20% reduction in cost thanks to fuel and maintenance savings.



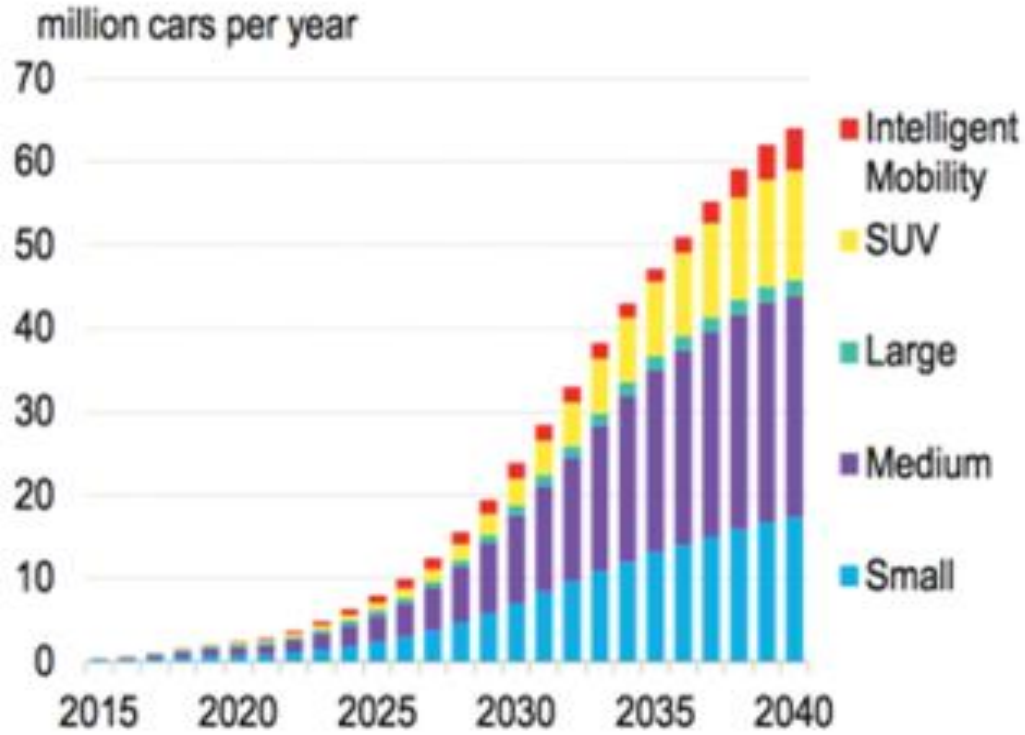
Source: www.cnet.com/tech/where-the-ev-revolution-goes-next/

EV sales projection: ~65m EVs per annum by 2040

Annual global EV sales by market



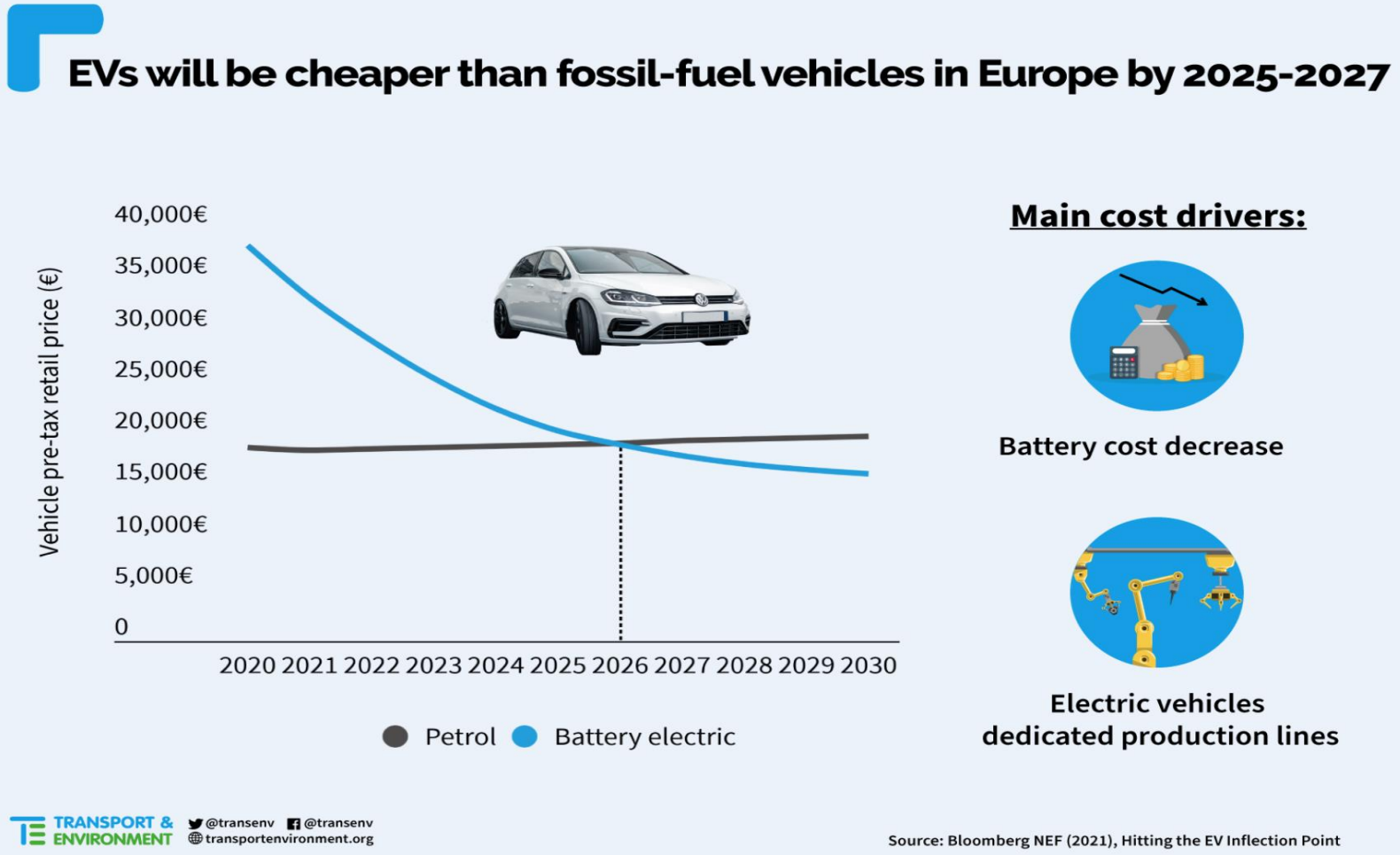
Annual global EV sales by vehicle class



Source: Bloomberg New Energy Finance

EV affordability to drive EV consumption

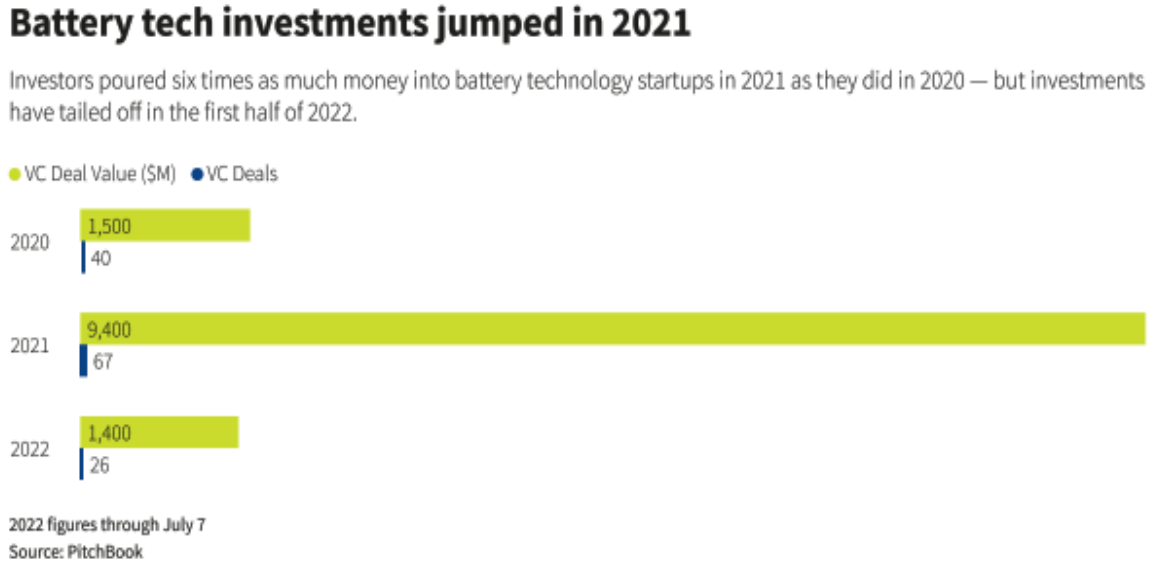
Sales of EVs continue to progress, but the pace of growth is hobbled by their cost, still at a premium in comparison with those of equivalent gas-powered vehicles. Analysts predict that the tipping point will be between 2025 and 2027.[1]



1 www.auto123.com/en/news/ve-costs-dropping-batteries-subsidies/65433/

Go small or go home

- In the race to go electric, carmakers have focused on range to ease consumer anxiety over charging infrastructure, but battery makers are already working on the smaller, longer-lasting and cheaper batteries of the future, which also charge more quickly.
- The battery is an EV's most expensive part, so true fast charging coupled with widely available chargers would allow automakers to build cars with smaller batteries at more affordable prices, yet boost profit by selling more vehicles to a broader audience.
- "We are in the larval stages of battery development," said Lincoln Merrihew, vice president at data analytics firm Pulse Labs.[1]
- According to startup data platform PitchBook, EV battery technology investments jumped more than sixfold to $9.4 billion in 2021 from $1.5 billion in 2020 as carmakers focused on the future.



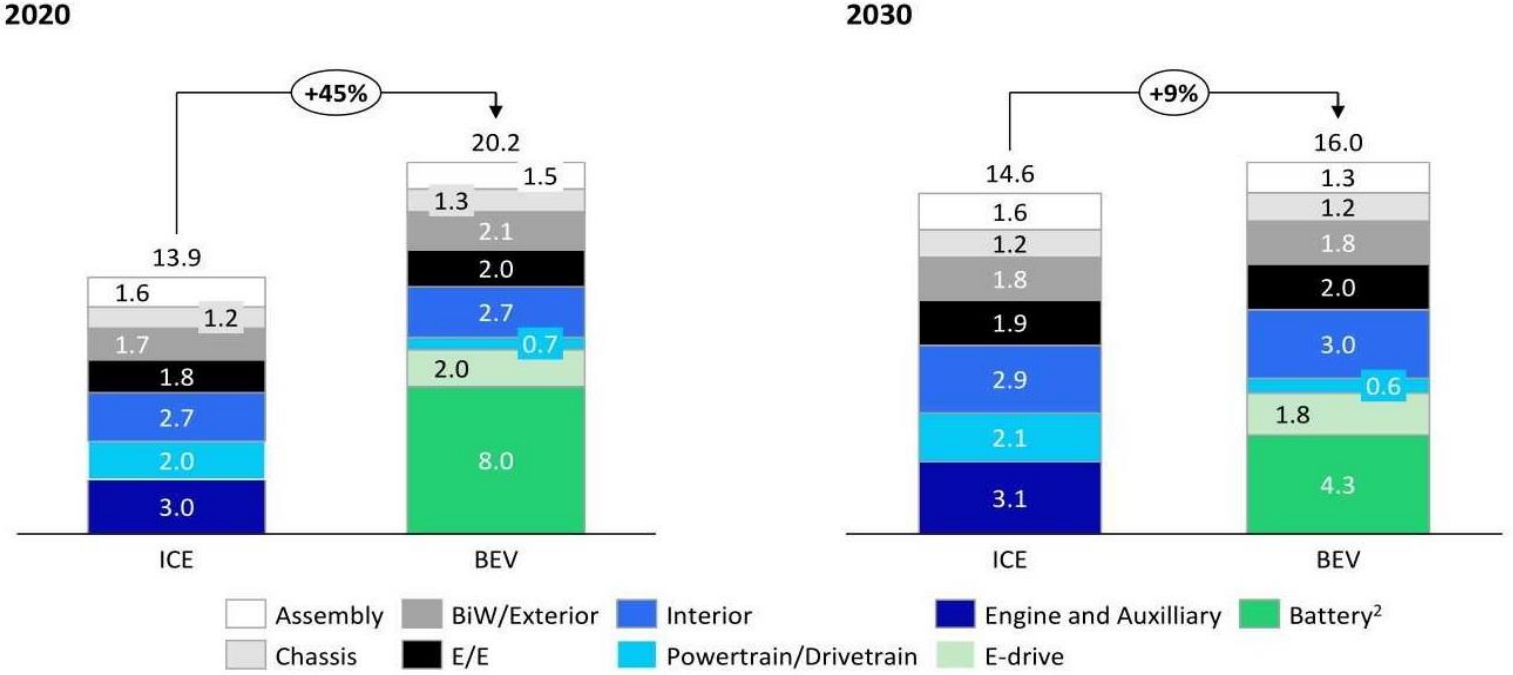
1 www.reuters.com/technology/ev-battery-makers-its-go-small-or-go-home-2022-07-11/

EV battery: currently ~40% of EV build cost

Vehicle cost development

Battery electric vehicles are expected to almost close the gap to internal combustion engine powered vehicles by 2030

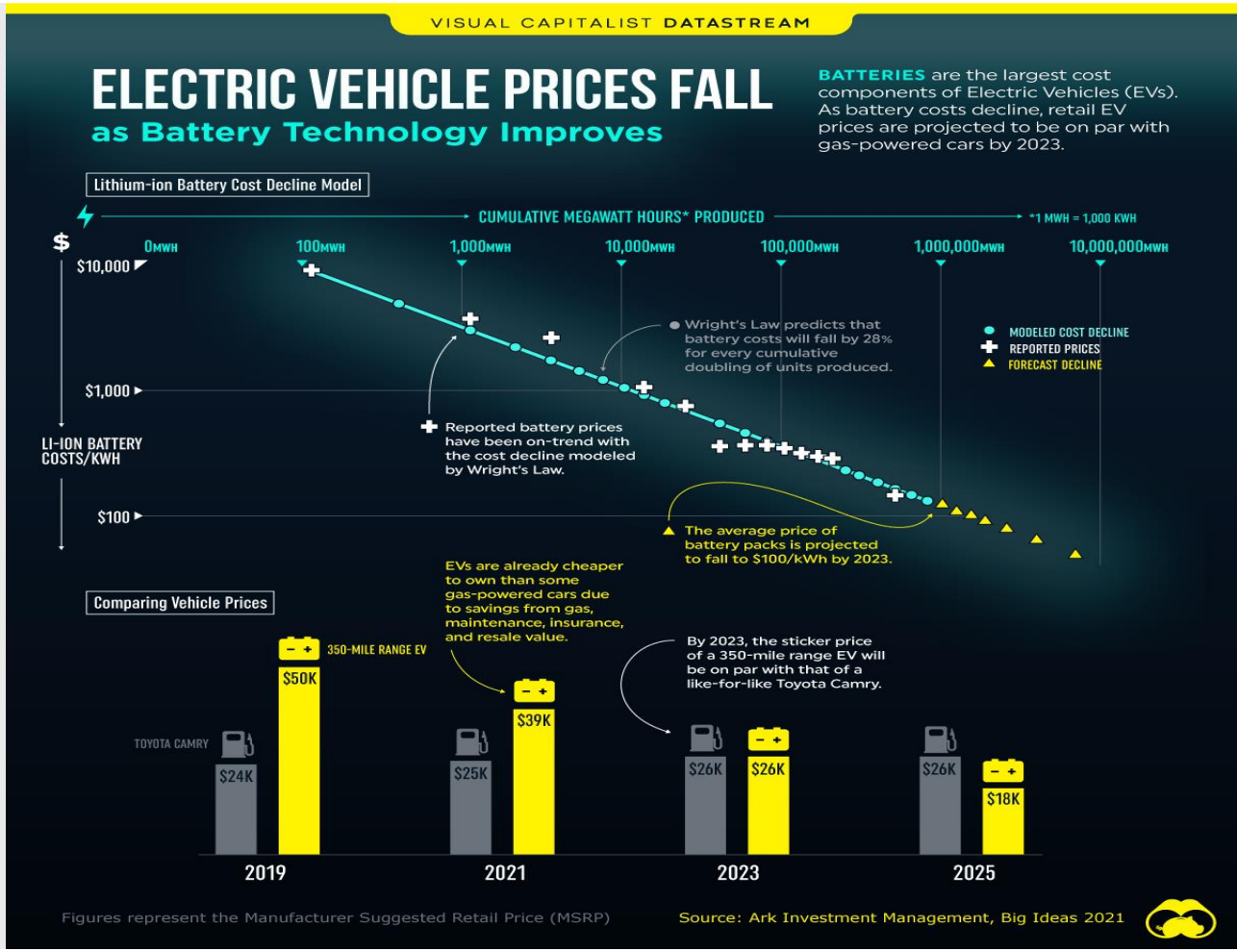
Comparison of direct costs ICE vs. BEV – European compact-class vehicle[1]
In thousand EUR



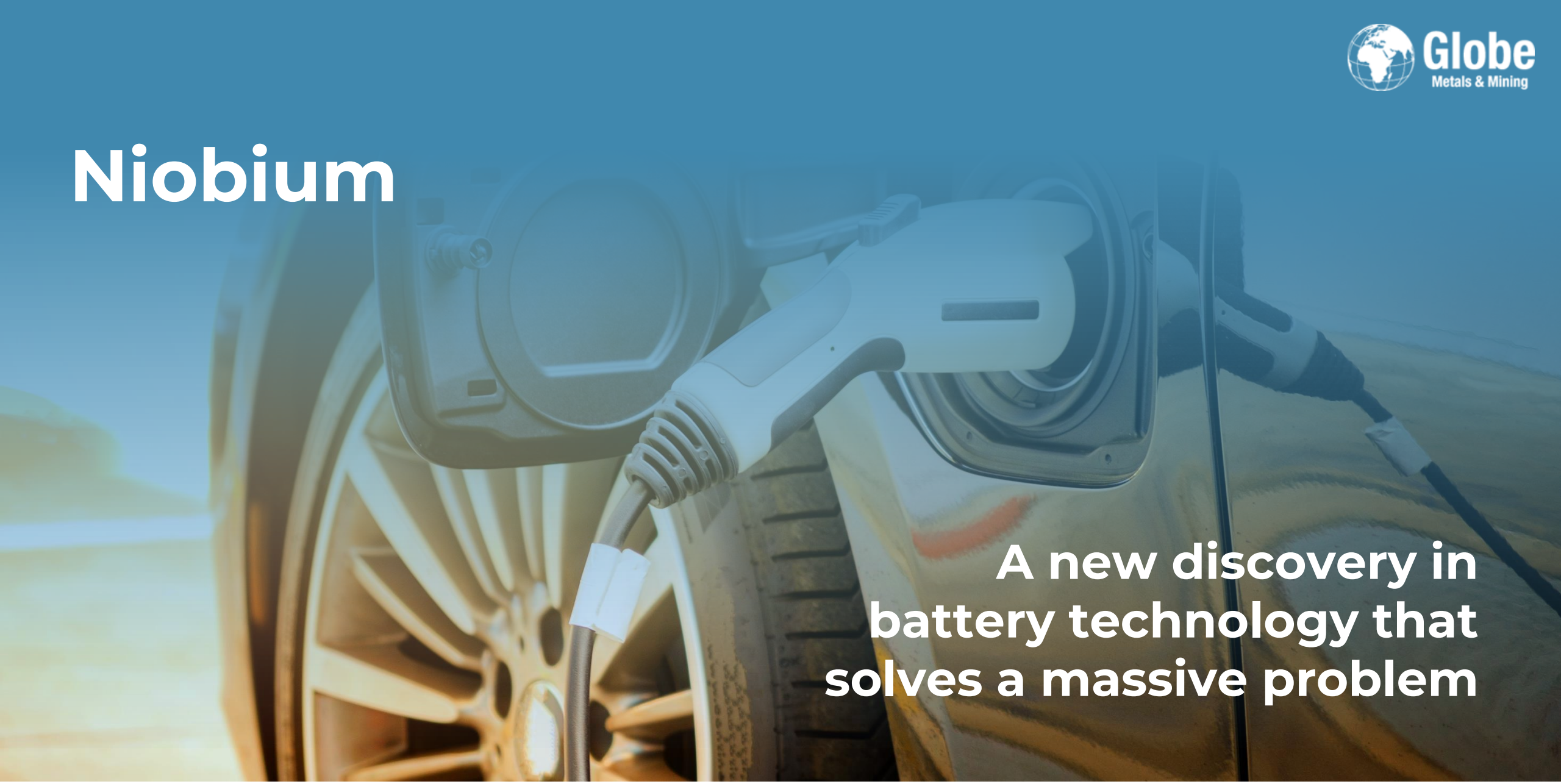
1. Does not include indirect costs (e.g. ramp-up, CAPEX, relative SG&A etc.)
2. Equals a 50kw/h battery with 160 €/kWh in 2020 and Equals with 85 €/kWh in 2030
Sources: Oliver Wyman FAST 2030 proprietary model, Bank of America, IEA Global EV Outlook, expert interviews, Oliver Wyman Research

Reduction in EV battery cost to drive fall in EV price

- Niobium battery technology is well placed to be at the forefront of technologies to be introduced to revolutionise the EV battery market and facilitate EV battery costs to fall.
- The race is on to make EV batteries smaller, lessening the requirement for critical metals such as nickel, copper, cobalt whilst maintaining range and power.
- Niobium battery technology companies such as Nyobolt, Echion, Nano One and Battery Streak are meeting this challenge.



Niobium



A new discovery in battery technology that solves a massive problem

E-batteries

Issues facing the EV industry

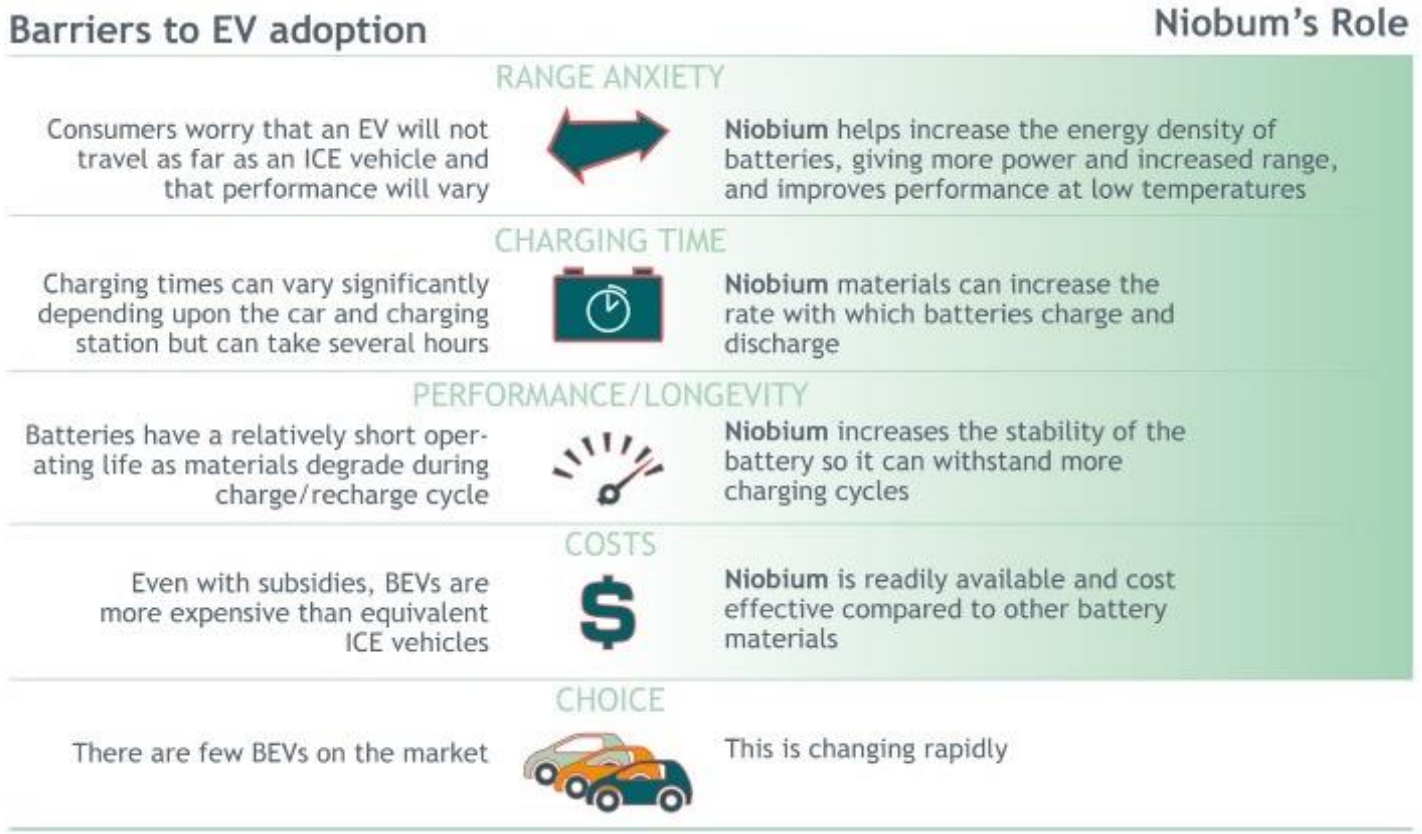
- The major issues facing the e-vehicle industry are widely stated as: fast charging, range and cost.
- The expected transition to electric vehicles away from internal-combustion-engine (ICE) vehicles that rely on fossil fuels is expected to increase rapidly from the point at which the cost of buying and operating an electric vehicle is neutral with that of ICE vehicles.
- Bloomberg New Energy Finance (BNEF) in their **2018 Electric Vehicle Report** predicted that *'the upfront cost of EVs will become competitive on an unsubsidized basis starting in 2024. By 2029, most segments reach parity as battery prices continue to fall'*.
- Prices of battery metals have spiked and are expected to push battery costs up in 2022 for the first time in more than a decade.
- 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) contains around 8 kg of lithium, 35 kg of nickel, 20 kg of manganese and 14 kg of cobalt.
- Niobium has the potential to be part of the solution to fast charging, range and cost.

Niobium's use in e-batteries

Solving the fast charging, range anxiety and cost issues

Niobium addresses almost all of the major barriers to EV adoption

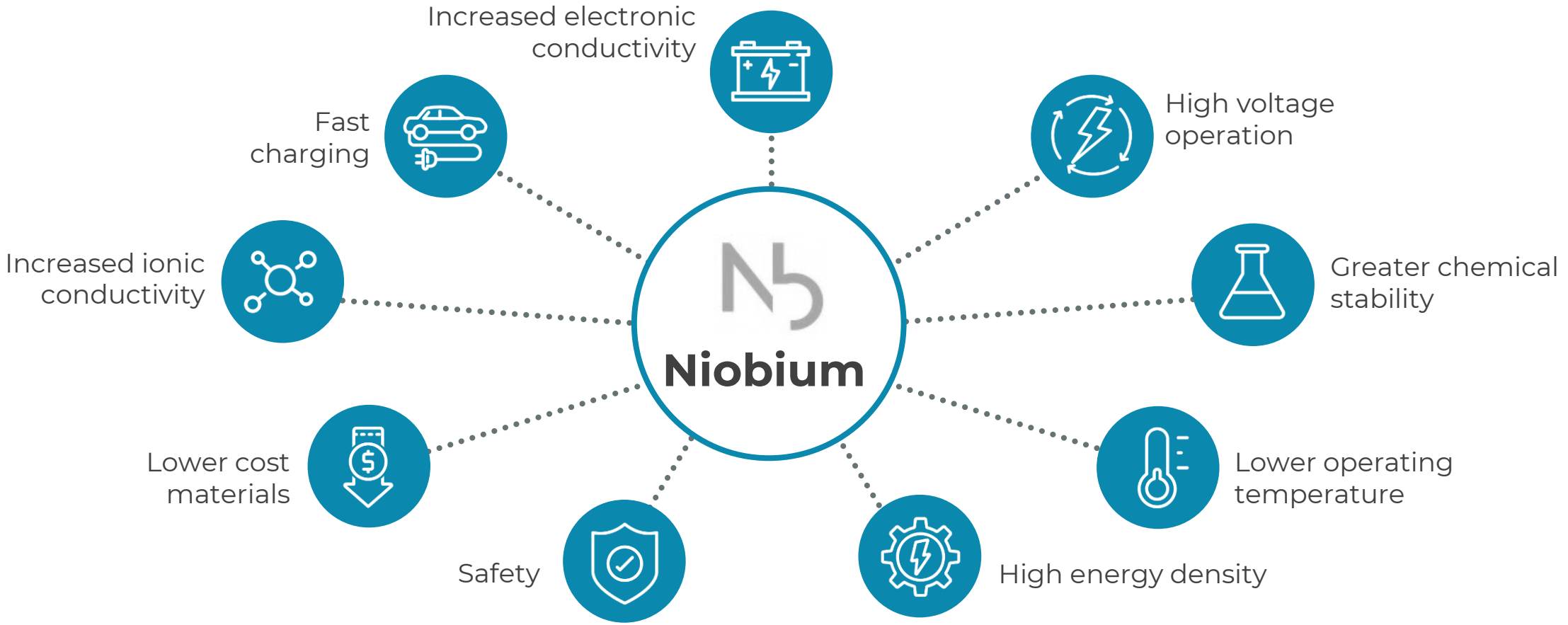
Why is Niobium important for LIB development?



Niobium's use in e-batteries

Solving the fast charging, range anxiety and cost issues

Niobium addresses almost all of the major barriers to electric vehicle adoption

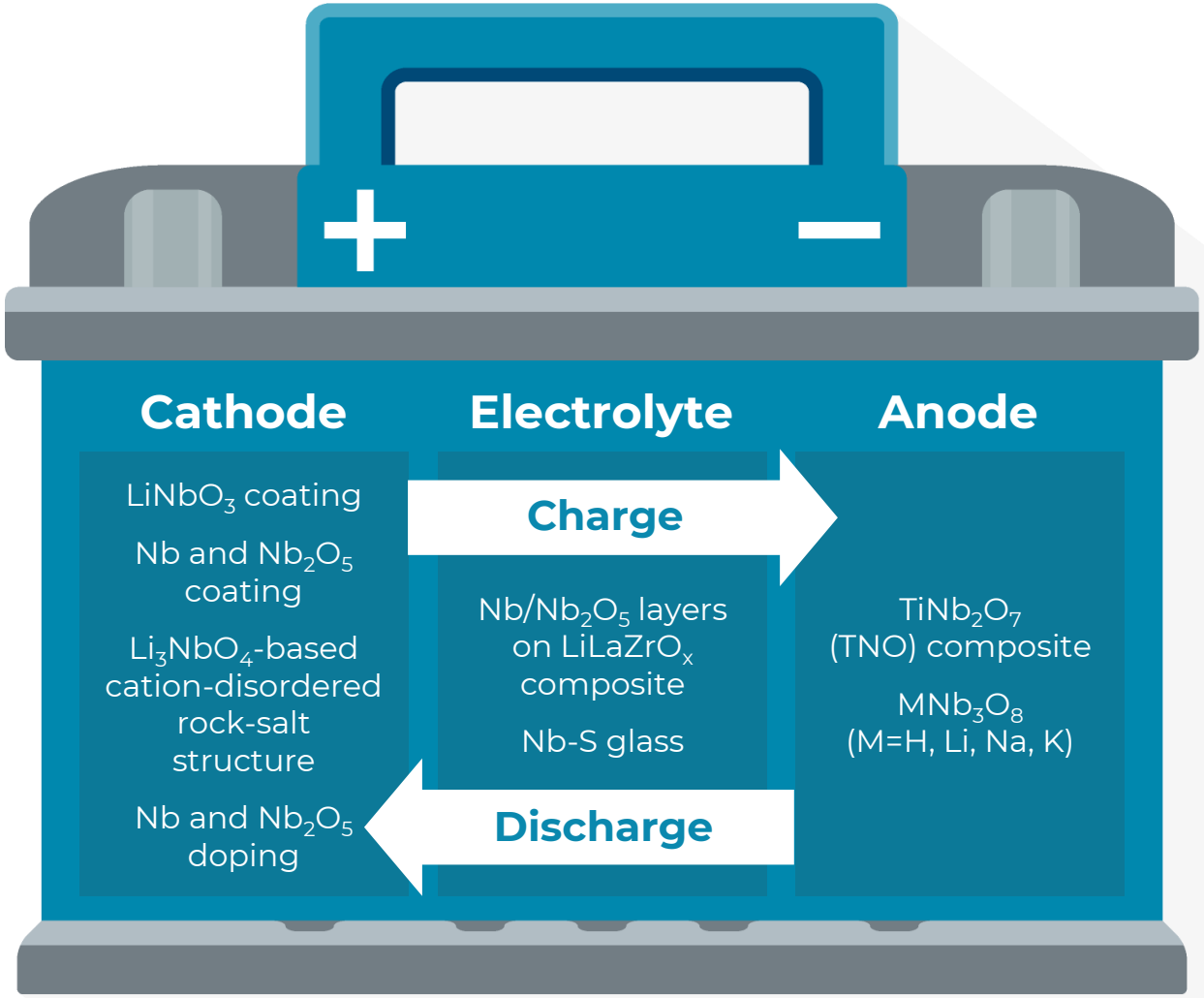


Source: CBMM-Niobium in Li-Ion Batteries

E-batteries

Issues facing the EV industry

How does Niobium work in lithium ion batteries?



Niobium effect on Li-ion e-batteries

Explained in layman's terms

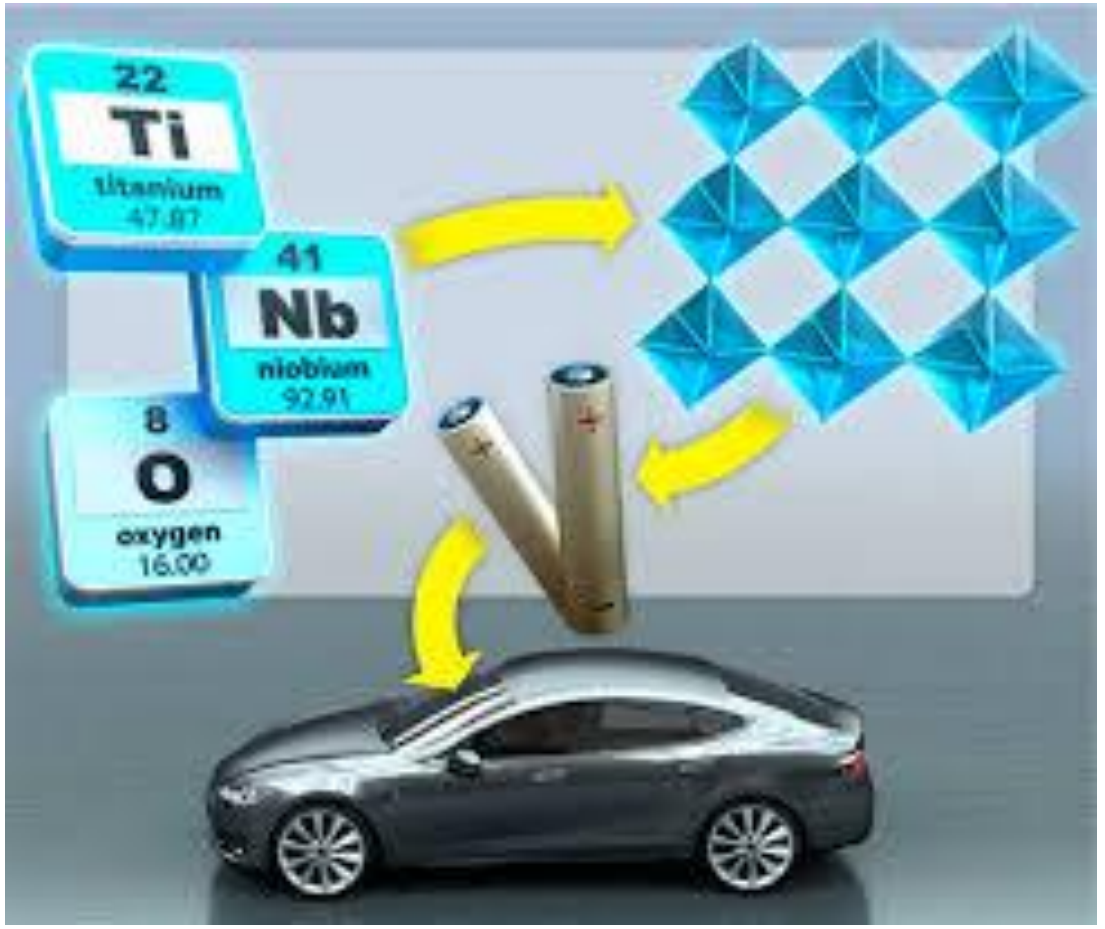
- When charging a traditional battery, positively charged lithium ions start at the lithium metal cathode and migrate to a negatively charged anode. The anode is usually made of graphite – a crystalline carbon structure that traps and holds the ions in a process known as intercalation. This works well enough, but it requires the lithium ions to penetrate deep into the graphite lattice and undergo a chemical phase transition, releasing heat which can cause batteries to short circuit, overheat and catch on fire.
- The process can also get bogged down if the metal ions don't penetrate deep enough into the carbon matrix and instead clump to form a metal coating. This is what is referred to as lithium plating. The lithium metal grows and forms "dendrites" that can pierce the separation barrier and short circuit potentially causing fire.
- Replacing the graphite in the anode with niobium solves – or at least improves – both of these problems. Due to the larger surface area of the niobium oxide molecules, lithium ions don't need to penetrate deep into the crystal lattice or undergo any phase transitions to remain in place. Instead, the lithium ions "nestle" onto the surface of the niobium lattice.

Source: https://dot.la/niobium-battery-streak-2657786737.html

Fast charging revolution

Niobium based anodes

- High-power energy storage devices are required for many emerging technologies. The charging rate capability of existing energy storage devices is inadequate to fulfill the requirements of fast charging and discharging while maintaining suitable long-term stability and energy density. This is readily apparent when evaluating the current anode of choice, graphite, which does not have an acceptable high-rate capability using traditional electrolytes.
- Tungsten Niobium (TNb) and Titanium Niobium Oxide (TiNbO) anode materials have been shown to provide high charge/discharge rates, excellent stability, and reasonable capacity.



Source: https://pubs.acs.org/doi/abs/10.1021/acs.energyfuels.0c02732

Industry leader: CBMM – banking on EV demand

CBMM is spending big on R&D and banking on electric vehicle demand

- **February 2021:** CBMM's Vice President Ricardo Lima announces that CBMM is predicting that its sales of niobium oxide, used in the production of batteries, will reach 45,000 tons by 2030, up from just 100 tons currently. Lima also said that if CBMM's forecasts were met, sales of niobium oxide would rise to represent about 25% of CBMM's revenues.

https://www.reuters.com/article/brazil-mining-batteries/brazil-miner-cbmm-seeks-to-sell-45000-tons-of-niobium-oxide-by-2030-idUSL1N2KF2VE?edition-redirect=in

- **March 2021:** CBMM will invest around 200mn reais (US$35m) in its technology program, with an annual increase of close to 60% for the batteries area.
- CBMM is expanding its niobium oxide production capacity to target electric vehicle makers. In the coming weeks CBMM will inaugurate a new manufacturing area in Araxá, Minas Gerais state, which will allow it to reach a capacity to produce 150,000t of niobium products annually.

https://www.bnamericas.com/en/news/brazil-niobium-miner-cbmm-eyes-startup-acquisitions

CBMM
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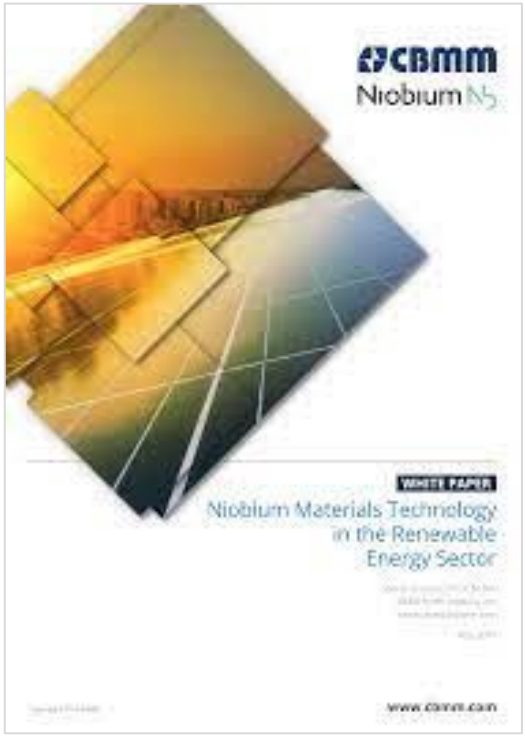
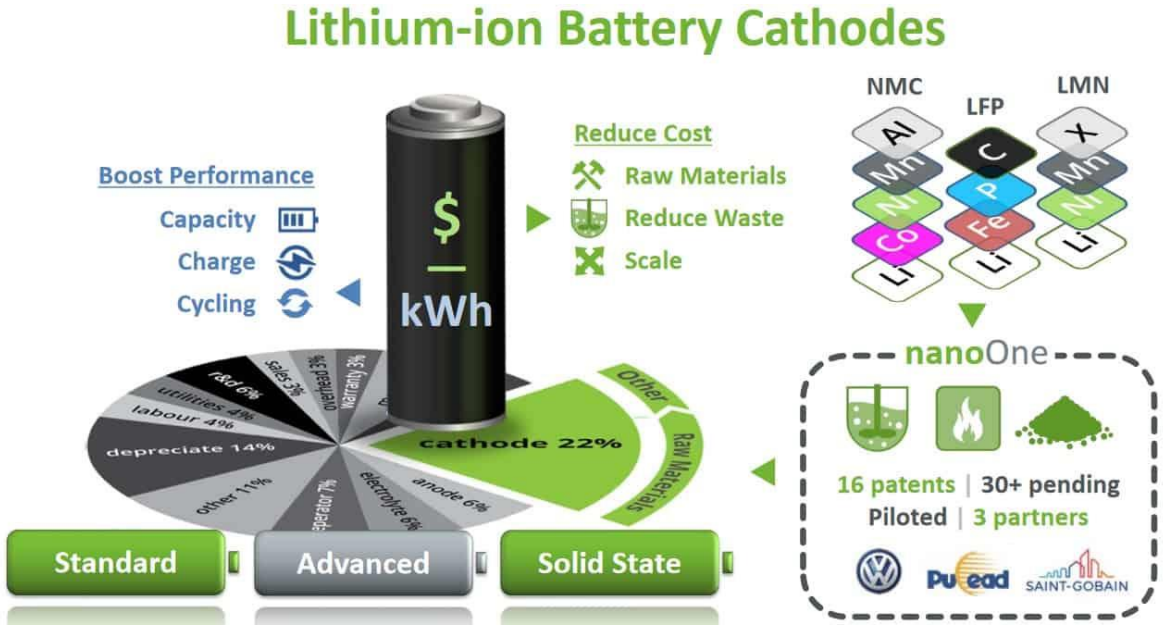


Industry leader: CBMM – banking on EV demand (cont'd)

- **May 2021:** CBBM and TSX listed Nano One® Materials Corp announce that they have entered into an advanced lithium-ion battery cathode materials coating development agreement.
- Nano One is a clean technology company with a patented low carbon intensity process for the production of low cost, high-performance cathode materials used in lithium-ion batteries.



"Nano One has successfully demonstrated the use of niobium as a coating for various cathode materials and has several related patents now granted and pending," "Our One-Pot process enables us to form coatings simultaneously with the underlying cathode material. This avoids extra steps and costs while enabling individual nanocrystals, also known as single crystals, to be coated for increased durability. With the support and partnership of CBMM, we will build on these successes and optimize our One-Pot process for the production of niobium coated nickel rich cathode materials for demanding applications such as electric vehicles."

www.newsfilecorp.com/release/83095/Nano-One-Enters-into-a-CoDevelopment-Agreement-with-Niobium-Producer-CBMM

Nyobolt

The company fast becoming the first Niobium related EV business major success story

- Nyobolt is a UK based company which has developed battery anodes using niobium and tungsten.
- A spin out of Cambridge University's Yusuf Hamied Department of Chemistry, Nyobolt's technology is based on a decade of research on battery anode materials.
- Cofounded in 2019 by Professor Clare Grey, DBE, FRS and Dr Sai Shivareddy, the company's technology brings end-to-end fast charging solutions to applications ranging from power tools and home appliances to electric vehicles and industrial robotics.
- In July 2022 Nyobolt raised US$59 million primarily to fund a battery manufacturing plant.

https://www.electrive.com/2022/07/19/nyobolt-raises-50-million-in-funding/#:~:text=British%20fast%2Dcharging%20battery%20startup,to%20begin%20manufacturing%20at%20scale

- This investment values Nyobolt in excess of GBP300m (~US350M)

4

NEWS www.businessweekly.co.uk news@busines

Nyobolt value hits £300m

Nyobolt, Cambridge's pioneer of end-to-end fast-charging battery systems, has revealed the initial close of a £50 million Series B round which will enable the company to enter a stage of manufacturing at scale. The financing takes Nyobolt's value to £300m.

The Series B is led by German materials power player H.C. Starck Tungsten Powders (HCS), a subsidiary of Masan High-Tech Materials, one of the world's largest tungsten suppliers. Tungsten is a key component of Nyobolt's technology. Nyobolt's existing investor – IQ Capital – is also participating in the round.

The investment is set to drive Nyobolt's market entry by establishing its presence and launching the manufacturing of millions of units next year.

H.C. Starck funding will enable Nyobolt's first materials manufacturing plant in the UK as well as expansion of the US cell engineering facility and the teams' growth across the globe.

Co-founded in 2019 by Professor Clare Grey and CEO Dr Sai Shivareddy, Nyobolt

and recycling aims to provide a sustainable solution supporting the transition to net zero in multiple sectors.

The ultra-fast charging battery solution developed by world renowned experts at Nyobolt drastically decreases charge time from hours to minutes, maximising uptime and productivity. Nyobolt's technology will lead the world towards transport decarbonisation, by erasing the greatest barrier preventing drivers from going electric – charge anxiety.

The technology is applicable for devices ranging from home appliances to electric vehicles and industrial robotics, improving performance and revolutionising energy storage markets.

As well as ensuring security of supply of key materials, this strategic partnership will enable Nyobolt to benefit from the established recycling capabilities of H.C. Starck, allowing the efficient use of resources to minimise the environmental impact of Nyobolt's ultra-fast charging batteries.

The collaboration will lead to a sustainable supply chain for Nyobolt's technology, making the technically demanding process of battery recycling easier and more

966 × 709

CBMM: Collaborations – Part 1

Recent R&D has demonstrated the importance of Nb to making highly efficient and rapid charging batteries

Toshiba banking on Niobium Titanium Oxide Anode to grow its battery market share

- Toshiba's SCiB™ rechargeable battery is presently used in a wide range of fields, from automobile to social infrastructure. Not content, Toshiba's SCiB™ battery's evolution has reached a point of re-examining its core identity—the anode material. Toshiba is focused on working with niobium titanium oxide (NTO) as the next-generation anode material for its outstanding characteristics. The new battery offers high- energy density and the ultra-rapid recharging required for automotive applications and will give a compact electric vehicle (EV) with a drive range of 320km after only six minutes of ultra-rapid recharging—three times the distance possible with current lithium-ion batteries.

https://www.toshiba-clip.com/en/detail/p=791

Bender exploring Niobium as a viable alternative to cobalt

- Developing new battery components is a challenge for electric vehicle manufacturers. In addition to performance and safety, eliminating the need for resources from sources of concern, such as the cobalt present in the positive electrodes (cathodes) of batteries, is essential for the success of the final product. Cobalt consumption is increasingly on the rise. By 2029, the demand for this metal will be equivalent to 300,000 tons compared to the 70,000 tons consumed in 2019, according to estimates by Benchmark Minerals.
- More than 60% of cobalt available in the market is produced in the Democratic Republic of Congo, where its extraction and exploitation has been linked to corruption, environmental destruction, child labor and human rights violations. Bender Motors, on the other hand, will use niobium to develop and manufacture the positive electrodes for the batteries of its electric vehicles.
- Bender has identified that niobium has other advantages when applied to the development of materials for positive battery electrodes, for example, niobium improves thermal characteristics, which favors safety.

https://bendermotors.com.br/en/2020/06/22/niobio-ingrediente-chave-da-bender/

CBMM: Collaborations – Part 2

- CBMM, the niobium industry leader, and Horwin (Brazil), a leader in the motorcycle and e-scooter market, announced in March 2022 that they have teamed up to manufacture fast-charging electric motorcycles.

  See: Chinese E-Bikes Built in Brazil to Use Local Battery – Asia Financial News

- CBMM and VW Truck and Bus (Brazil) announced in October 2021 that they have teamed up to manufacture fast-charging batteries for VW's electric vehicles.

  See: Volkswagen Caminhões e Ônibus – Press Room (vwtbpress.com)

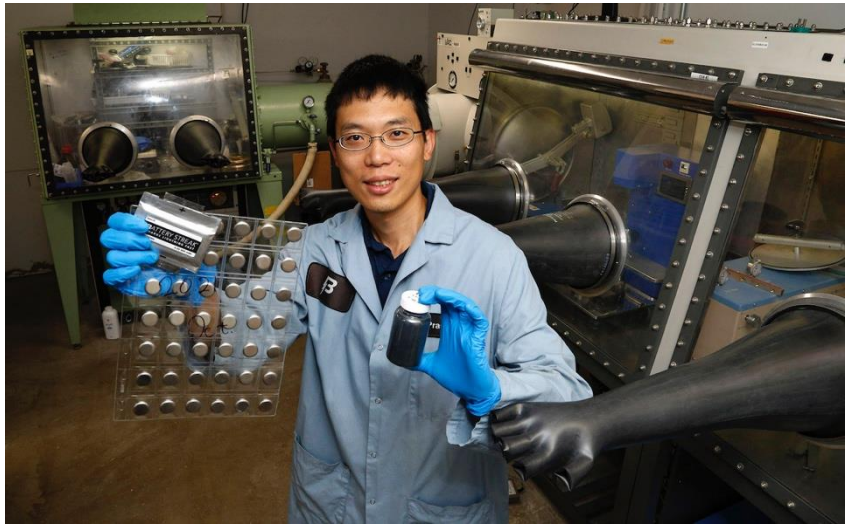
Horwin EK3 electric motorcycles. The new batteries will lower the charging time from three hours to about 10 minutes and have a longer life when compared to traditional batteries, according to Horwin.

Photo: Horwin Global

CBMM: Collaborations – Part 3

- **Aug 20221:** CBMM will acquire a 20% stake in Battery Streak for US$5 million.
- The investment aims to accelerate new technologies with using niobium in lithium-ion batteries.
- The investment allows Battery Streak to drive development and ramp production of its revolutionary, patented materials for a variety of applications including power tools, drones, medical devices, electric scooters, warehouse robots, and EVs, in civilian and military use cases.

https://batterystreak.com/battery-streak-nsf-grant-cbbm-investment/



Niobium battery technology companies

Globe Metals & Mining

Echion Technologies

BATTERY STREAK
CHARGE LIGHTNING FAST

CBMM
Niobium Nb

nyobolt

nanoOne

ASX: GBE

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