Behind the green curtain

Adventures on the path of critical mineral development

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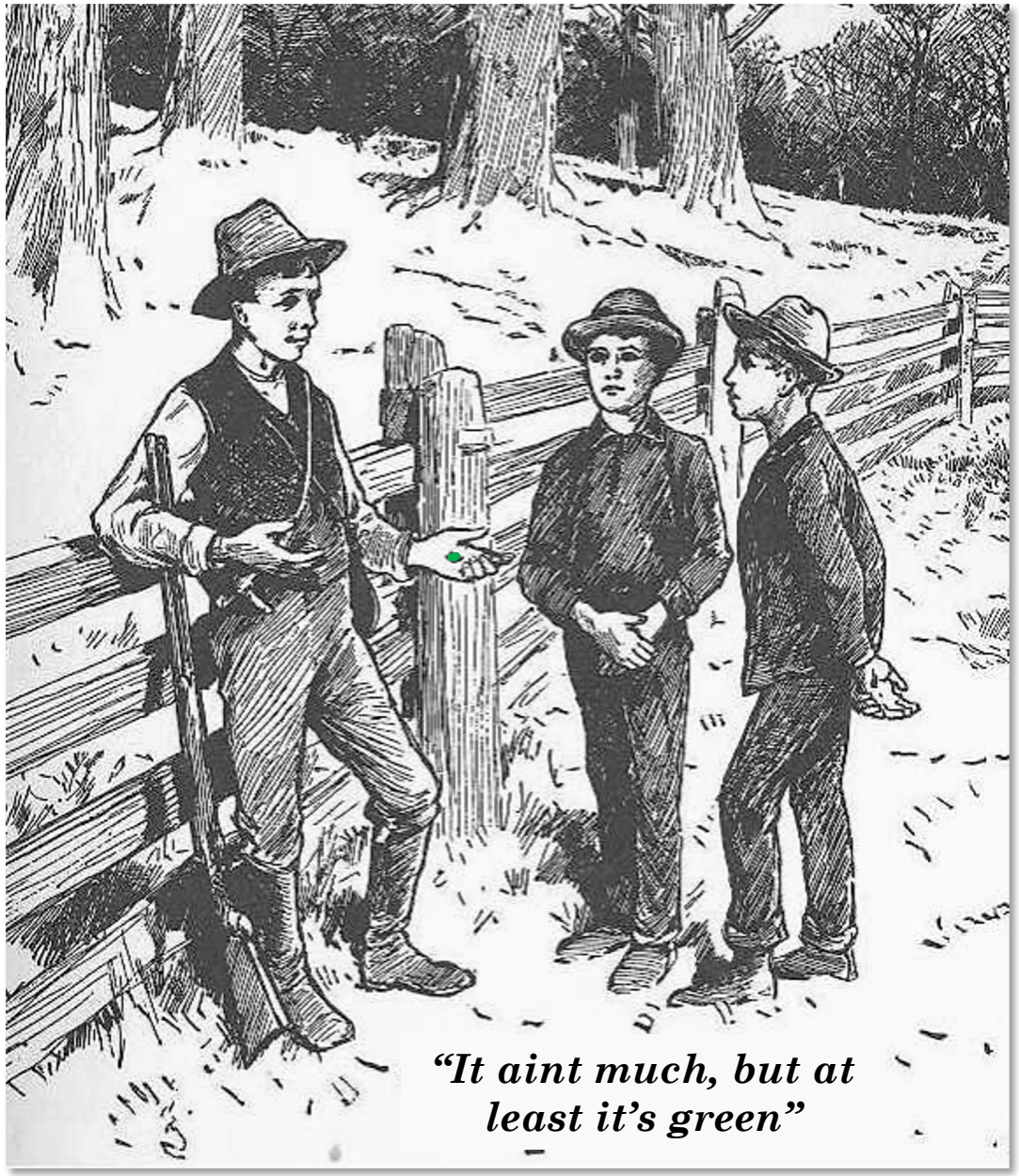
Critical Minerals: New Age

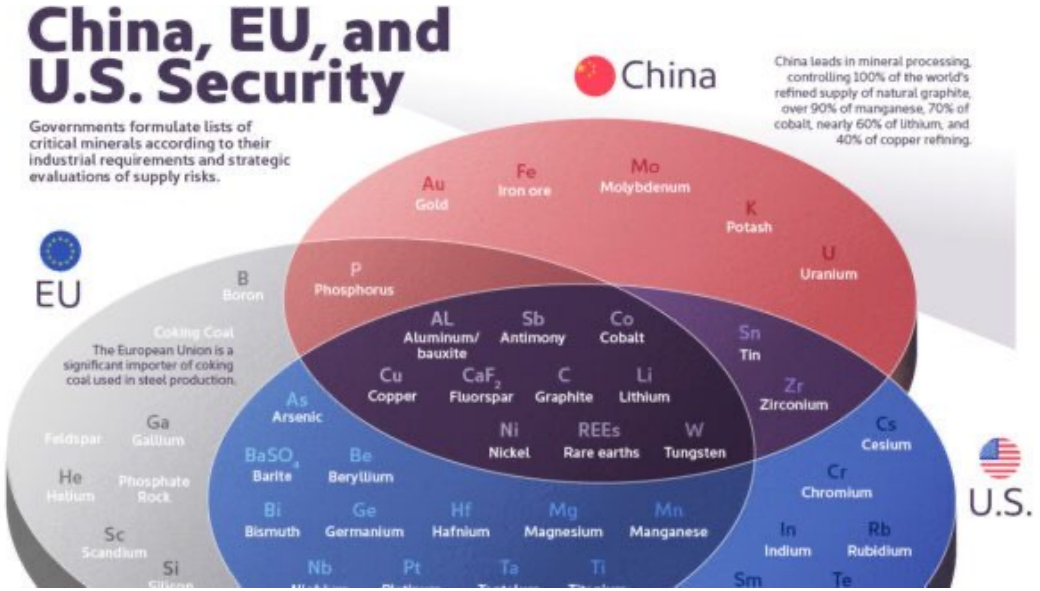
- **1st Lithium Boom Legacy (15 Years On)**
  - Sparked global excitement
  - Revealed more complex path of critical minerals vs. traditional metals
  - Novel hurdles arise: Financial, socio-environmental, regulatory
- **Understanding Gap?**
  - Has our grasp of these new mineral developments matched their technical/commercial complexities?
  - In truth these are specialty chemicals/engineered materials. Do we meet this reality from our commodity-based backgrounds?
- **Presentation Goal**
  - Spotlight a few key issues in this landscape
  - Spark discussion and have some fun while peeling back the ”green curtain” to try find real sustainability



Picture source: McGuffin Special Reader Part 20 “The Quarrel about the Nut”

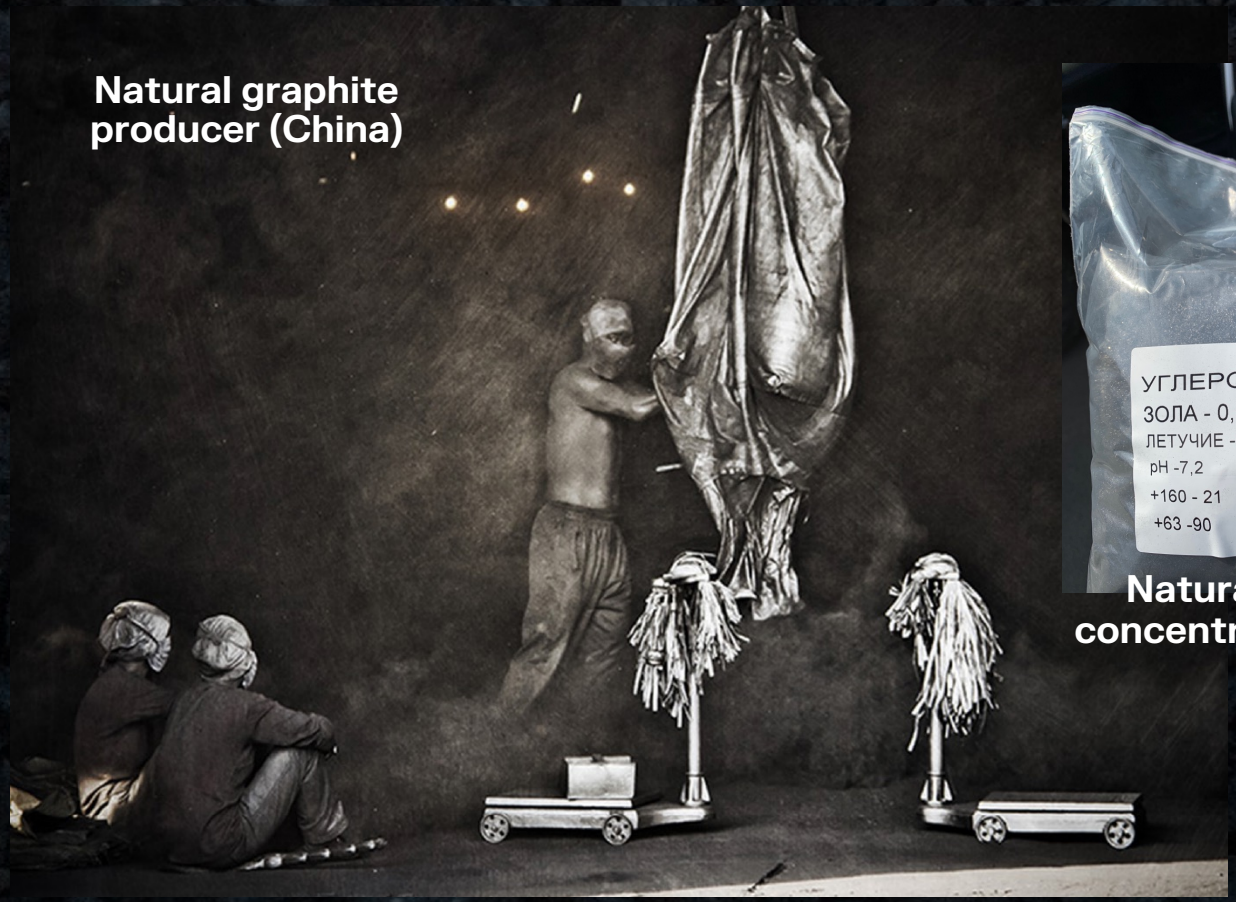
G for Geopolitics G for government

- **Western gov't push**
  - Funding bodies setup to try induce 'green' and critical mineral projects. Yay!
- **Key drivers**
  - geopolitical tensions
  - defence supply chain risks/national security
  - green transition 'PR'
- **Is it working? Is it smart enough?**
  - few projects built or advancing
  - minimal 'bang for buck' so far
  - throwing $$ at flashy but flawed projects
  - leaving unclosable funding gaps
- **Significant stakes**
  - wasteful spending stalls policy goals and real green transition
  - seek input from industry vets! Sharpen project choices & funding strategies



One example: Graphite

Traditionally sold by grade %C and flake size. Markets 1-2Mtpa in thousands of industrial uses: refractories, lubricants, pipeline seals, foundry facings, arc lamps, elec motor brushes, pencils etc. Deposit evaluation pretty simple…grade and size distribution. Resource estimation no problem.



Natural graphite producer (China)

Natural graphite concentrate (Ukraine)

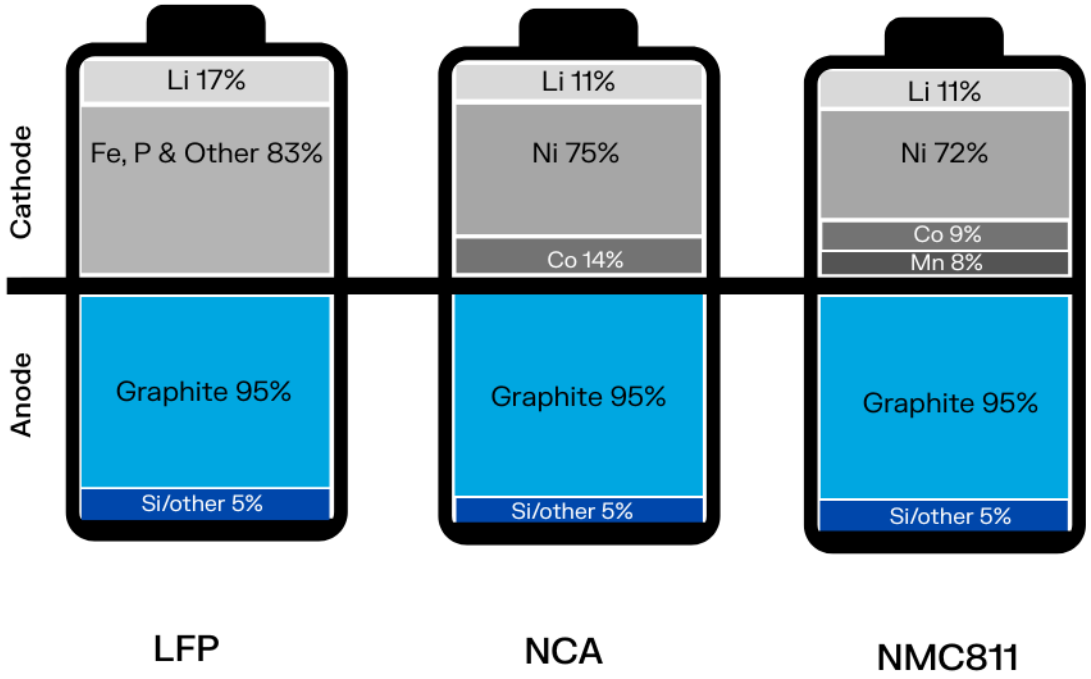
%C by LECO and SImilar

Mesh sized by Sieve

Graphite: battery volume king

New and biggest market – Li-ion battery anodes.

- **Dominant Role**
  - Active anode material in Li-ion batteries
  - Largest volume critical mineral
- **Critical Status**
  - Designated Critical & Strategic in USA/EU
- **Unique Traits**
  - Not a metal! No purity-based specifications, needs long-term battery testing to qualify
  - Mined *or* synthesised from fossil fuels (cokes, organic matter + heat/energy)
- **Development Challenges**
  - Complex journey: Raw deposit → final product
  - Economics hinge on final yield, not standard industrial metrics
  - China subsidised and dominant supply

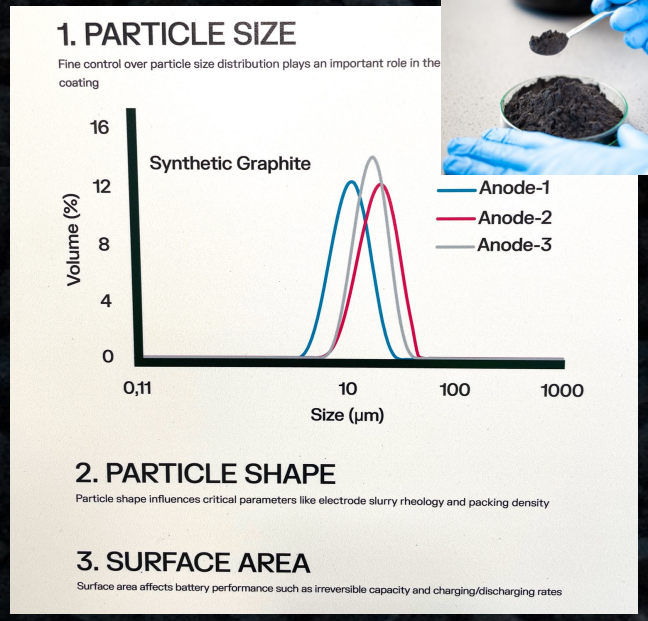


Source: BMO Research 2025, Industry Reports, Talga Group Presentation.

Graphite evaluation (for anode market)

After concentrate, a series of complex purification, shaping and coating steps with detailed assessment

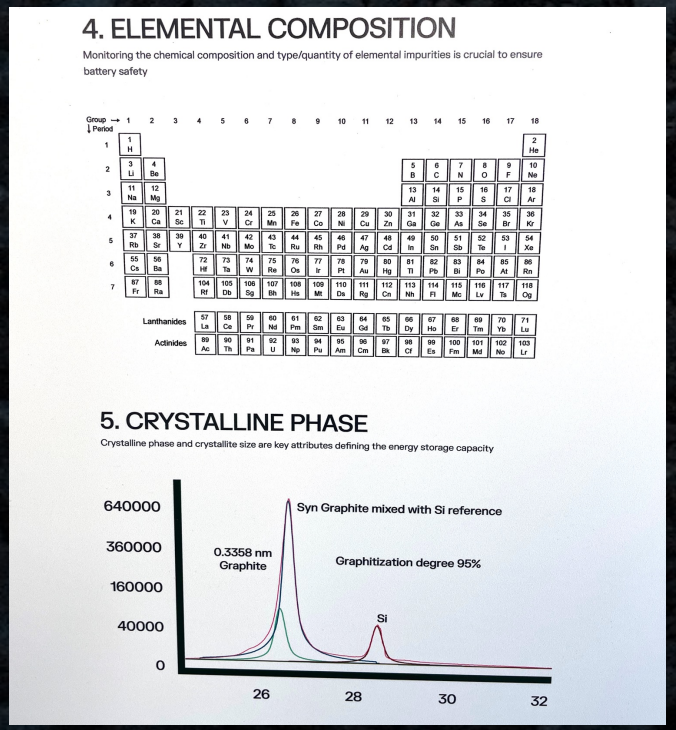
Sub-micron to nano size control



BET and Porosity

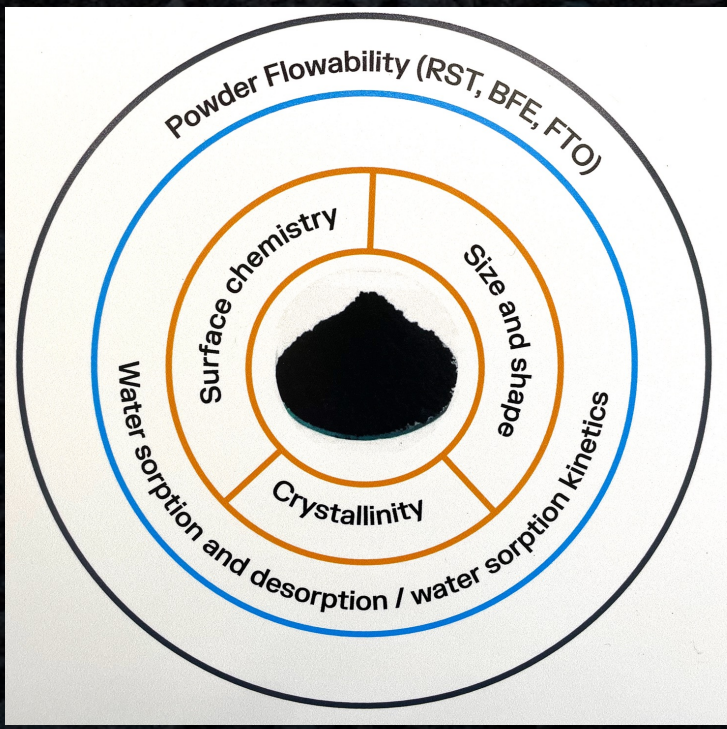
Sphericity

Sub-ppm Elements



Crystallinity (Raman, XRD)

Food and pharmaceutical grade particle control and measurements



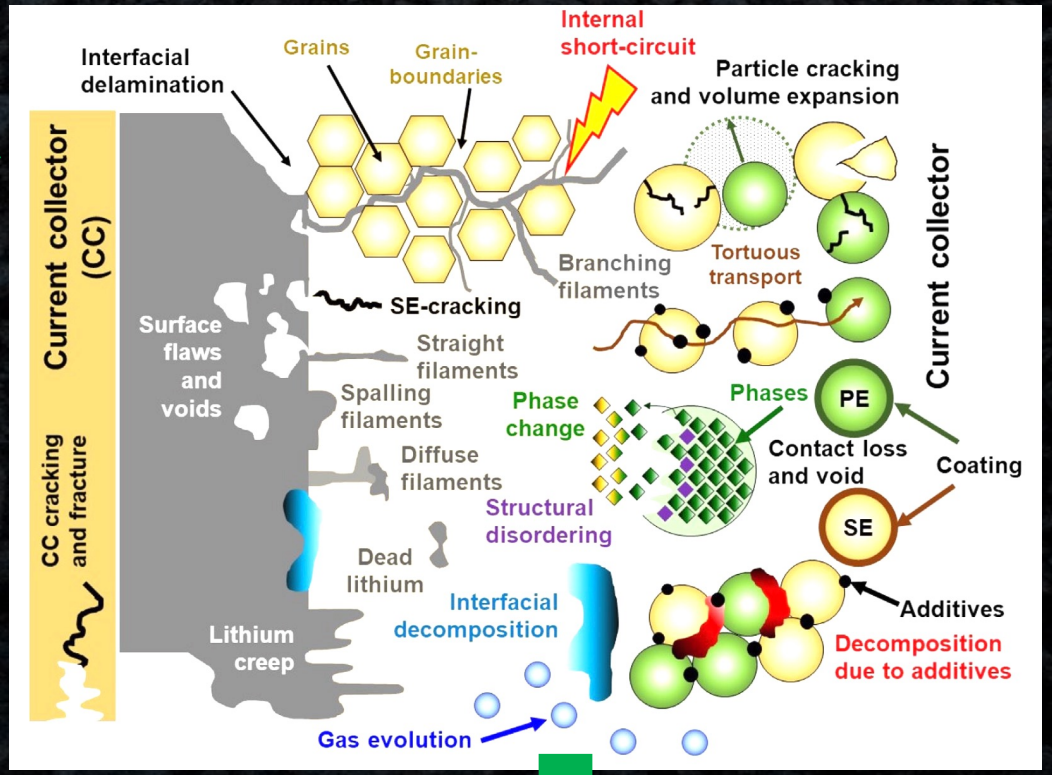
Continued overleaf...

Continued… evaluation (Li-ion battery anode)

Electrochemical testing

Cell cycling 3 months to 1 year

Qualification for commerciality.
2-5 years monitoring failure factors.



Market if customer happy. Q: is grade of the deposit and 'basket price' very relevant if commercial levels electrochemical performance unkown?

Anode degradation graphic © Mei-Chin Pang et al October 2021 "Interactions are important: Linking multi-physics mechanisms to the performance and degradation of solid-state batteries" Materials Today Vol 49

Financing critical minerals

- **The nature of financing critical mineral projects is already very, very tough, but also faces**:
  - opaque, small markets with oligopolistic pricing
  - immature (and expensive) equity and debt providers
  - severe price volatility and lack of hedging options
  - Almost 0% debt provided to China competitors

- **Shrinking pool of resource equity investors**
  - don't like 10+ year development timelines
  - have growing choice of quick wins
    (ETF, crypto, bio-stocks, token this/blockchain that)

- **New financing paradigm**
  - strategic partners + govn't aid is no longer optional, but necessary, just to level playing field

The ESG trap

- **Western Developers' Burden**
  - Strict ESG compliance for operations, stakeholder alignment, investment eligibility
- **Customers' Reality (OEMs/Battery Makers)**
  - Prioritise lowest cost over clean sourcing
  eg. Tesla's $5B Indonesia nickel deal
- **Unintended Consequences of Even Tighter ESG**
  - Reduces new projects by eroding competitiveness
  - Perpetuates "dirty" supply chains
- **A Path Forward**
  - Impose stronger regulations on *customers*, not just developers, and make them effective, fast
  eg, CFC's in refrigeration
  - Customers: find ways to help/time for some courage!

If we want to build Emerald Cities

We must keep learning the path,
and unite smarts with courage and heart