What if calcium became the new lithium?

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Calcium Power Play

Within Reach | **Transitional** | Visionary

Calcium batteries outperform lithium-ion to address energy storage needs through advances in design and materials for reliable performance across temperatures and cycles.

UNCERTAINTIES

Systems, Technology

MEGATREND (Most significant)

Energy Boundaries

TRENDS

ESG & Beyond GDP
Future of Raw Materials
Mobilising Innovation
New Materials

TECHNOLOGIES

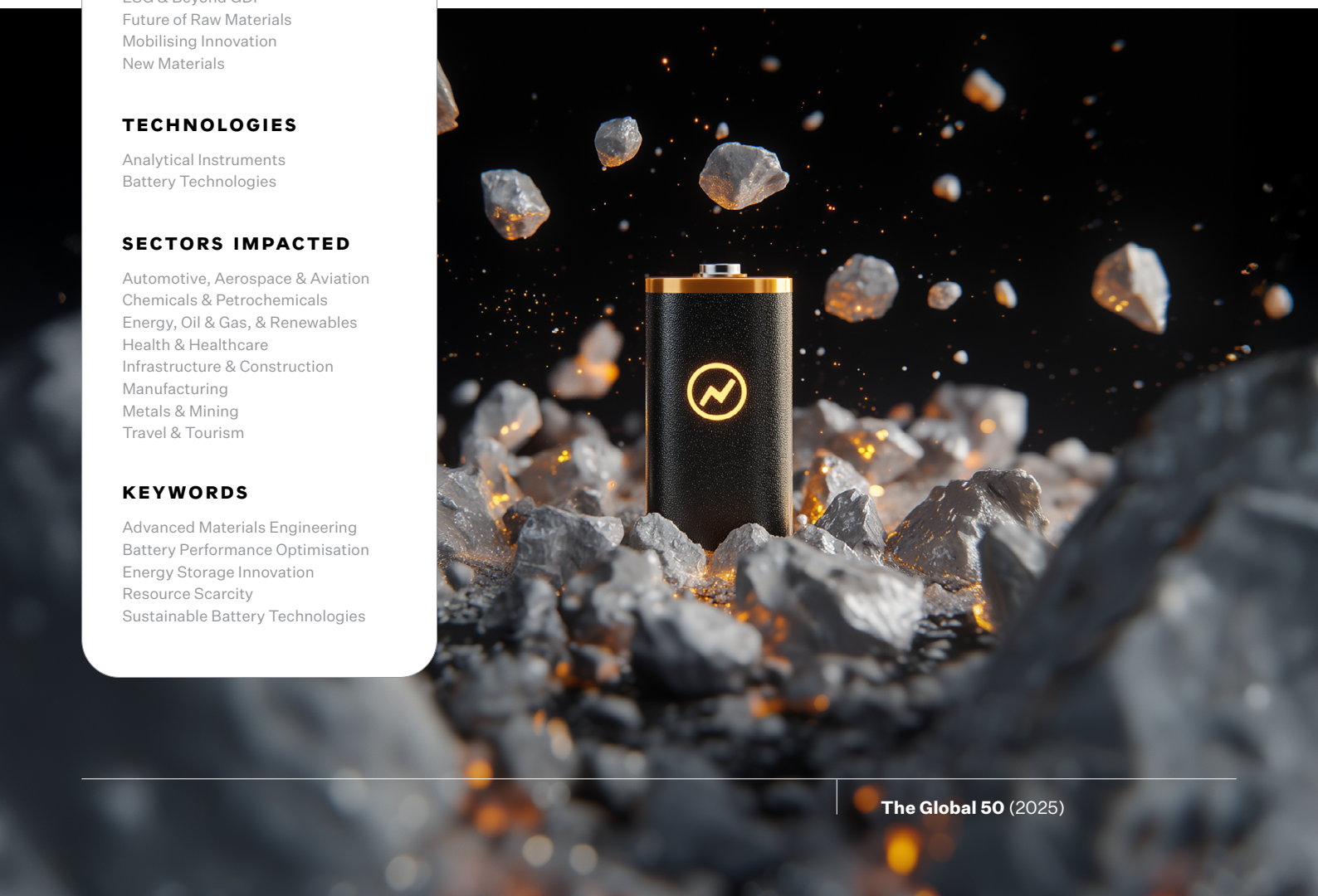
Analytical Instruments
Battery Technologies

SECTORS IMPACTED

Automotive, Aerospace & Aviation
Chemicals & Petrochemicals
Energy, Oil & Gas, & Renewables
Health & Healthcare
Infrastructure & Construction
Manufacturing
Metals & Mining
Travel & Tourism

KEYWORDS

Advanced Materials Engineering
Battery Performance Optimisation
Energy Storage Innovation
Resource Scarcity
Sustainable Battery Technologies



WHY IT MATTERS TODAY

Lithium demand surged by

30%

in 2023, partially driven by nearly

14 million

electric vehicle sales, yet anticipated **mine supplies will meet only 50% of requirements by 2035**

Because of their high energy, power density, and long cycle life,[743] lithium-ion batteries are the most used battery technology in portable electronic devices and vehicles.[744] However, as lithium demand rises rapidly,[745] there is an urgent need to find alternatives to address issues related to sustainability, resource scarcity, safety and cost.[746] The demand for lithium increased by 30% in 2023, with electric vehicle (EV) sales reaching almost 14 million, a 35% year-on-year increase.[747] With EV batteries lasting only five to eight years,[748] the anticipated mine supply of lithium will meet only 50% of requirements by 2035.[749]

Environmental and safety concerns are also significant. The manufacturing of lithium-ion batteries requires cobalt, lithium, magnesium and nickel – materials associated with health risks.[750] Moreover, only 5% of lithium-ion batteries are recycled globally[751] though exact numbers are unclear. In addition, these batteries pose significant fire risks, causing an estimated 48% of waste fires in the United Kingdom and costing £158 million annually.[752, 753]

Emerging alternatives include sodium-ion batteries, with car manufacturers, including those in China, planning EV rollouts by 2025.[754] Sodium, magnesium, calcium and potassium offer greener, scalable battery technologies,[755] with calcium offering the highest energy capacity.[756]

THE OPPORTUNITY

A new generation of calcium-based batteries outperform lithium-ion batteries[757] by overcoming longstanding barriers in calcium battery development.[758]

Calcium, one of the most abundant metals on Earth,[759] surpasses other battery metals (aluminium, lithium, magnesium, potassium, sodium and zinc) in both melting point and electrical conductivity.[760] Its higher melting point reduces fire risk compared with lithium batteries. Advanced machine intelligence, combined with novel materials, aids optimal battery design with suitable electrolytes and cathode components, ensuring consistent and reliable storage across different temperatures and over multiple charge cycles.[761]

BENEFITS

Affordable clean energy storage; reduced environmental impact; increased energy independence; global access to sustainable technologies; job creation in new industries; improved safety.

RISKS

Job losses in traditional lithium-focused industries; environmental risks from gathering new resources; technological uncertainties; disruption of established economies that rely on lithium.

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