

COMPETING AT THE UPSTREAM OF INNOVATION

The US-China Balance in Critical Minerals

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If a company is heavily dependent on foreign countries for its core components, and **if the 'major artery' of the supply chain is in the hands of others, it is like building a house on someone else's foundation.** No matter how big and beautiful it is, it may not stand up to wind and rain, and it may be so vulnerable that it collapses at the first blow.

-Xi Jinping, 2016

Summary

- The US-China competition has centered on peacetime salvos; critical minerals have emerged as a prominent battleground
- China's competitive orientation is long-standing: Beijing has been explicit about the national security value of cultivating whole-of-value chain control of critical minerals dating back to the 1986 Mineral Resources Law
- US policy has been activated by recent supply shocks; efforts are under way to identify and prioritize critical inputs, to develop secure supply, to expand trusted processing capacity
- But on top of a lagging US position, an asymmetry exists: China approaches critical minerals with offensive as well as defensive orientations; China also disproportionately invests its early-stage R&D resources into innovating at the upstream
- Defense acquisition has a vital role to play in competing across these supply lines

Definitional Differences

Strategic and Critical Minerals, as Defined by China and the US		
China: Strategic Minerals		US: Critical Minerals
Energy minerals	Oil, natural gas, shale gas, coal, coal bed methane, uranium	Aluminum, antimony, arsenic, barite, beryllium, bismuth, cerium,* cesium, chromium, cobalt, dysprosium,* erbium,* europium,* fluorspar, gadolinium,* gallium, germanium, graphite, hafnium, holmium,* indium, iridium, lanthanum,* lithium, lutetium,* magnesium, manganese, neodymium,* nickel, niobium, palladium, platinum, praseodymium,* rhodium, rubidium, ruthenium, samarium,* scandium,* tantalum, tellurium, terbium,* thulium,* tin, titanium, tungsten, vanadium, ytterbium,* yttrium,* zinc, and zirconium.
Metallic minerals	Iron, chromium, copper, aluminium, gold, nickel, tungsten, tin, molybdenum, antimony, cobalt, lithium, rare earths, zirconium	
Non-metallic minerals	Phosphorus, potash, crystalline graphite, fluorspar	

US designations of “critical minerals” cover 50 minerals (in 2022), 27 of those are also designated by China and 23 are unique to the American process

Competitive Positioning

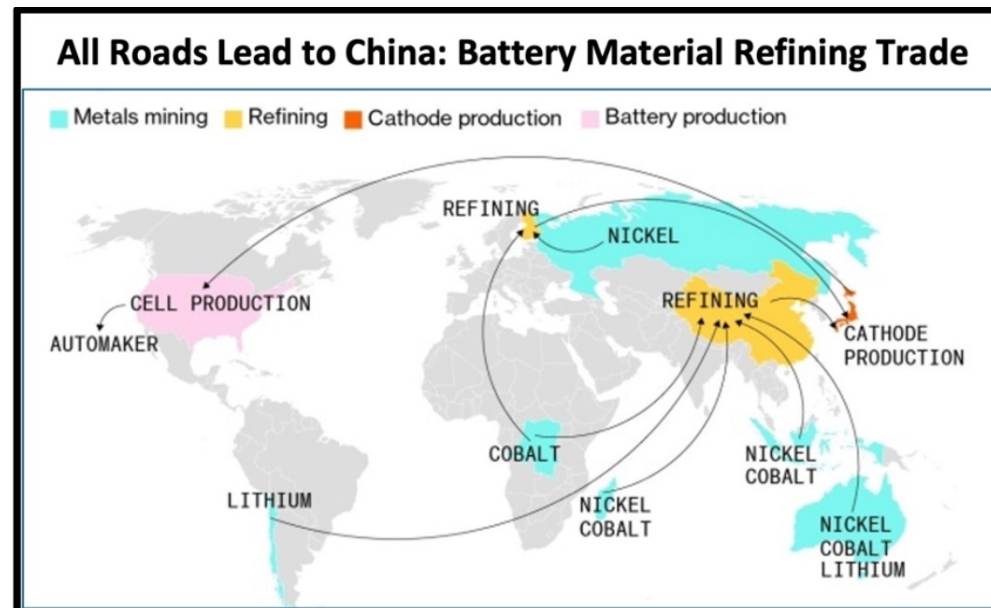
The United States is more than 50 percent import dependent in 38 of the minerals that it has identified as critical. In five of the remaining 12 cases, there is insufficient data to assess US import dependence. The US is also 45 percent import dependent in copper and 93 percent in potash, both of which China defines as “strategic minerals,” though the US does not. And in 30 of its 50 critical minerals – including 25 of the 38 in which it is more than 50 percent import dependent – the US relies on China as one of its major suppliers. By contrast, according to available figures, chromium is the only strategic mineral for which China is essentially completely reliant on foreign imports.

China is competitively positioned in terms of both access to the minerals themselves and production through midstream processing.

US Import Dependence and Sources in Prioritized “Critical Minerals”			
Prioritized by	Mineral	US Import Dependence (%)	Major US import sources (2020-2023)
China/US	Aluminum	47	Canada, UAE, Bahrain, China
China/US	Antimony	85	China, Belgium, India, Bolivia
China/US	Cerium	80	China, Malaysia, Japan, Estonia
China/US	Chromium	77	South Africa, Kazakhstan, Canada, Finland
China/US	Cobalt	76	Norway, Finland, Japan, Canada
China/US	Dysprosium	80	China, Malaysia, Japan, Estonia
China/US	Erbium	80	China, Malaysia, Japan, Estonia
China/US	Europium	80	China, Malaysia, Japan, Estonia
China/US	Fluorspar	100	Mexico, Vietnam, South Africa, China
China/US	Gadolinium	80	China, Malaysia, Japan, Estonia
China/US	Graphite	100	China, Canada, Mexico, Mozambique
China/US	Holmium	80	China, Malaysia, Japan, Estonia
China/US	Lanthanum	80	China, Malaysia, Japan, Estonia
China/US	Lithium	>50	Chile, Argentina
China/US	Lutetium	80	China, Malaysia, Japan, Estonia
China/US	Neodymium	80	China, Malaysia, Japan, Estonia
China/US	Nickel	48	Canada, Norway, Australia, Brazil
China/US	Praseodymium	80	China, Malaysia, Japan, Estonia
China/US	Samarium	80	China, Malaysia, Japan, Estonia
China/US	Scandium	100	Japan, China, Philippines
China/US	Terbium	80	China, Malaysia, Japan, Estonia
China/US	Thulium	80	China, Malaysia, Japan, Estonia
China/US	Tin	73	Peru, Bolivia, Indonesia, Brazil
China/US	Tungsten	>50	China, Germany, Bolivia, Vietnam
China/US	Ytterbium	80	China, Malaysia, Japan, Estonia
China/US	Yttrium	100	China, Germany
China/US	Zirconium	<25	South Africa, Australia, Senegal
US only	Arsenic	100	China, Morocco, Malaysia, Belgium
US only	Barite	>75	India, China, Morocco, Mexico
US only	Beryllium	0	
US only	Bismuth	89	China, Republic of Korea
US only	Cesium	100	Germany, China
US only	Gallium	100	Japan, China, Germany, Canada
US only	Germanium	>50	Belgium, Canada, China, Germany
US only	Hafnium	NK	Germany, China
US only	Indium	100	Korea, Japan, Canada, Belgium

Asymmetric Orientations

- China approaches critical minerals with both offensive and defensive ambitions
- China eschews its “fast follower” orientation when it comes to critical minerals and disproportionately invests to innovate at the upstream
- As competition increases, it is apparent that Beijing’s whole-of-value chain positioning further exacerbates vulnerabilities and poses acute risks for US efforts



Defense Acquisition's Role

- Deterrence and warfighting capability depend on material supply; efforts to compete in the critical mineral battlefield should be prioritized accordingly and reflected in program requirements and threat intelligence inputs into the acquisition process
- Near-term efforts to secure supply need to be informed by China's positioning and the threat of Beijing's pricing power
- Double down on defensive efforts to secure supply; invest in next generation innovation that can seed offensive positioning

“Enterprise competition is no longer a competition among individual companies, but rather among supply chains.”