



Rockstone Research

January 17, 2017

Report #3

Diamonds and Niobium in
Canada



Geologist inspecting niobium-rich outcrops on the CAP Property in British Columbia.

Drill Program to Find One of the “Trump Metals”: Niobium

This week, Donald Trump will be moving into the White House. His presidency is expected to boost demand for commodities as the elect has pledged to enact growth fueling tax cuts and infrastructure spending after being sworn into office on Friday.

The US Department of Defence has declared niobium as one of its top “strategic” metals as it is not mined domestically, is a matter of national security and is important to the nation’s economy. The US government maintains a stockpile of niobium at all times and according to the USGS, the DLA Strategic Materials plans to acquire more niobium to address the current shortfall. The US imports all of its niobium from Brazil (83%), Canada (12%) and others (5%).

Today, Arctic Star Exploration Corp. [reported](#) to have started permitting for a drill program on its wholly owned CAP Property, located within the central parts of the Rocky Mountain Rare Metal Belt, 80 km northwest of Prince George in British Columbia, Canada.

In 2010, Arctic Star acquired this property for its potential to host niobium-tantalum and/or rare earth elements (“REEs”). Since then, these commodities have undergone a dramatic shift in demand owing in part to their usage in the green energy sector, which includes modern wind turbines, rechargeable batteries, catalytic converters etc. Past exploration identified a large anomaly to be drill tested shortly, potentially discovering a niobium-rich deposit.

Company Details

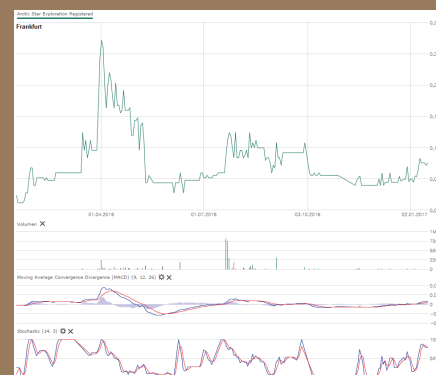
Arctic Star Exploration Corp.
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Vancouver, B.C. V6E 4M3, Canada
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Shares Issued & Outstanding: 49,529,106



▲Chart Canada (TSX.V)

Canadian Symbol ([TSX.V](#)): ADD
Current Price: \$0.12 CAD (01/16/2017)
Market Capitalization: \$6 million CAD



▲Chart Germany (Frankfurt)

German Symbol / WKN: 82A1 / A2DFY5
Current Price: €0.076 EUR (01/17/2017)
Market Capitalization: €4 million EUR



Niobium focused companies performed well in 2016. One of them was MDN Inc., which changed its name to NioBay Metals Inc. following the announcement of their acquisition of the **James Bay Niobium Project** in Ontario which has a historic indicated resource with a grade of 0.52% Nb₂O₅. The company's stock appreciated by about 900% in 2016.

The year before, NioCorp Developments Ltd. (originally structured by Zimtu Capital Corp.) reported an indicated resource grade of 0.71% Nb₂O₅ assuming a 0.3% cut-off grade at its **Elk Creek Niobium Deposit** in Nebraska, USA. NioCorp's current market capitalization exceeds \$130 million CAD.

Stretching for some 2,500 km from just above Idaho and Montana in the south to the Yukon in the north, Mother Nature has created the right geological environment along the **Rocky Mountain Rare Metal Belt** for the emplacement of both REEs and rare metals. Some explorers have been active along the belt for several years.

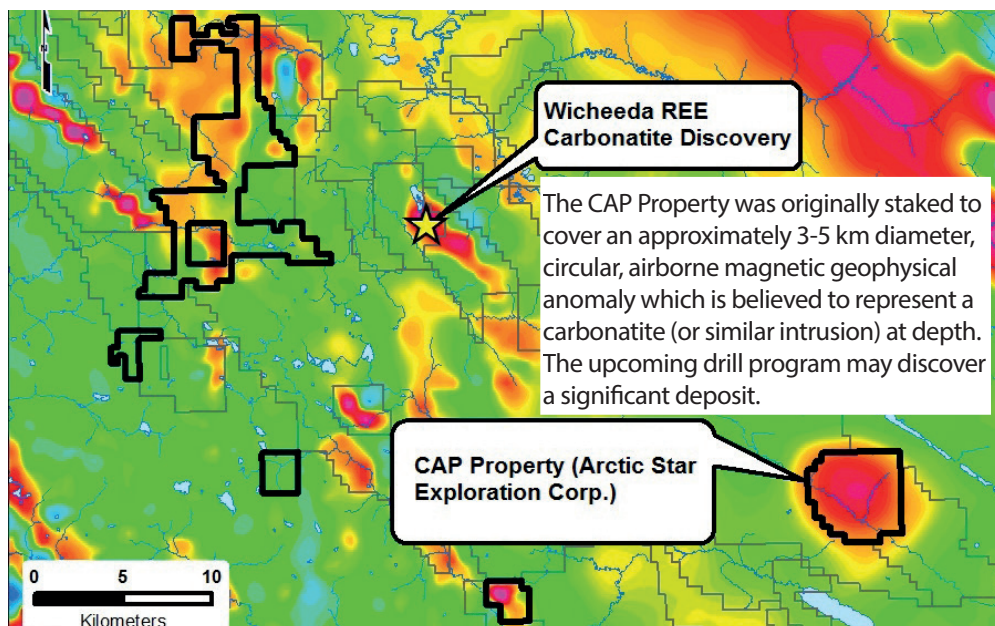
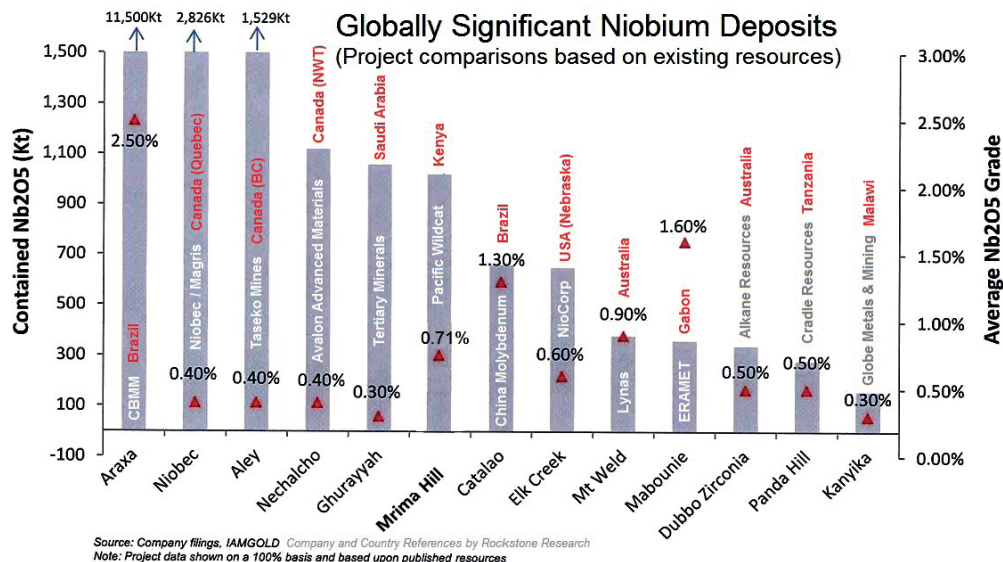
Arctic Star's **CAP Property** (2,825 hectares) is located within the central parts of this belt and about 50 km southwest of the **Wicheeda REE Carbonatite** from Spectrum Mining Corp., a private company. Wicheeda's Main Zone was drill tested with 15 holes at 3 sites in 2008/2009; highlights included:

- **3.55% REE** over 49 m
- **2.92% REE** over 72 m
- **2.2% REE** over 144 m

This discovery prompted a staking rush in the region and over a dozen companies have been conducting exploration programs.

Commerce Resources Corp. owns the advanced-stage **Blue River Tantalum-Niobium Project** north of Kamloops in BC, where substantial resources have been defined. The company is currently focused on its other project, the Ashram REE Deposit in Québec.

Taseko Mines Ltd. (+155% in 2016; current market capitalization: \$340 million CAD) acquired the **Aley Niobium**



Project, 140 km north of Mackenzie in BC, in 2007 and now hosts an extensive body of niobium mineralization as indicated by drilling, with grades averaging 0.4% Nb₂O₅.

On the **CAP Property**, 2 narrowly outcropping syenite dikes have been identified and sampled near the crest of the ridge that trends from northwest to southeast across the property. The dikes contained highly anomalous geochemistry (potentially indicative of a large and higher grade deposit below surface), including:

- **0.48-0.98% Nb₂O₅ (481-981 ppm)**
- **1.13-3.19% zirconium**
- **>0.1% lanthanum**
- **>0.1% cerium**
- **>0.05% neodymium**

These high-level dikes indicate that the source of the magnetic geophysical anomaly may be associated with a **carbonatite**, or similar intrusion. Geologically, the Cap Property has similar potential to the known carbonatite complexes worldwide. **Carbonatite-related deposits** are a major host for rare metals, such as niobium and tantalum, and REEs. The world's largest niobium mine, **Araxa** in Brazil, and several of the world's largest REE deposits, including Lynas Corp's **Mt. Weld Deposit** in Australia and MolyCorp's **Mountain Pass Deposit** in the US, are all hosted by carbonatites. Geologically similar exploration projects include Hudson Resources Inc's **Sarfartoq Carbonatite Project** in Greenland and Rare Element Resources Ltd's **Bear Lodge Carbonatite Project** in Wyoming, USA.



Niobium's Price Dominance

For almost 50 years now, only 3 primary niobium mines are responsible for global supply:

Niobec (Québec, Canada)

- Deposit: **Pegmatite**
- Share in world supply: **~7%**
- Average grade: **0.4-0.53% Nb₂O₅**
- Owned by Magris Resources, a privately-held company (purchased from IAMGold for \$500 million CAD in 2015)

Catalao (Brazil)

- Deposit: **Carbonatite**
- Share in world supply: **~7%**
- Average grade: **0.9-1.3% Nb₂O₅**
- Owned by China Molybdenum since April 2016 (\$1.5 billion transaction with Anglo American)

Araxa (Brazil)

- Deposit: **Carbonatite**
- Share in world supply: **~85%**
- Average grade: **~2.5% Nb₂O₅** (but with a 50% recovery)
- Owned by CBMM (Companhia Brasileira de Metalurgia e Mineração)

CBMM is a privately-held company, founded in 1955; since 1965 controlled by the Moreira Salles family, which became one of Brazil's wealthiest families primarily thanks to its bet on niobium.

Between 2006-2008, CBMM doubled the price of ferroniobium to address the strong demand growth that was, according to CBMM, not priced in correctly.

As niobium prices remained flat over the last 9 years, CBMM may increase prices again to better reflect heightened demand.

Demand for niobium is expected to increase on the backs of national defense and the production of high-efficiency vehicles and super-alloys.

Global steel production is expected to increase its usage of niobium (to make steel stronger and lighter) from currently about 10% to up to 20% over the next few years.

Global Niobium Supply

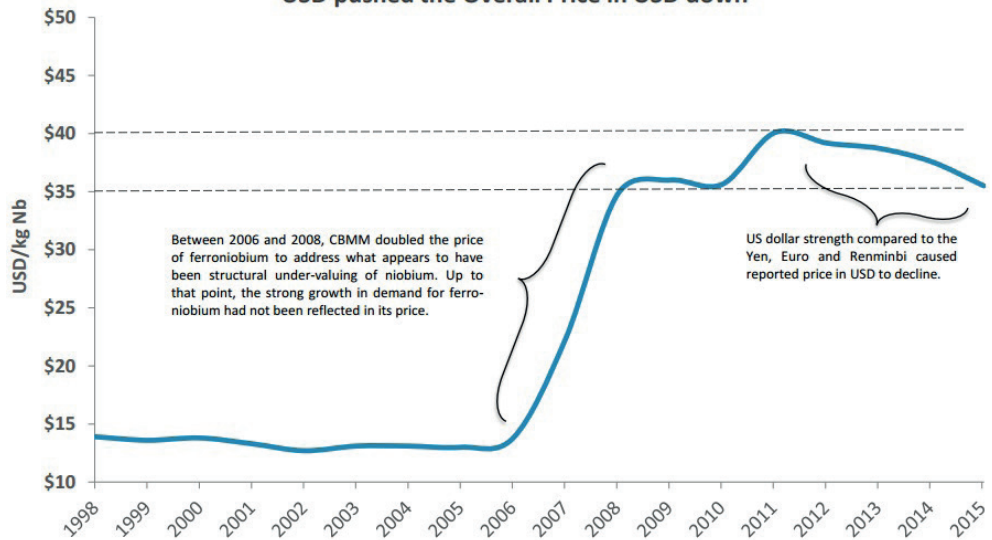
	CBMM	Catalao	Niobec
Ownership	CBMM (70%) Japanese & Korean Consortium (15%) Chinese Consortium (15%)	Anglo American	Magris Resources
Location	Brazil	Brazil	Canada
Deposit Type	Carbonatite	Carbonatite	Carbonatite
Resource (Mt)	+800	38	105 ¹
Resource Grade (%Nb ₂ O ₅)	2.50%	0.93%	0.53%
Production Capacity (FeNb) (t)	110,000	10,000	8,300
Mine Life (years)	+400	+35	+20
Recoverable Unit (Nb ₂ O ₅ kg/t)	15.0	3.91	2.97
Value Note	Sold 30% for \$US3.9B	Expansion of \$US350M (2015) To be sold to China Moly for 1.5B\$	Sold for \$US500M in 2015
Comments	Upcoming capacity increase ?	Recovery & sales issues	Significant investments will be required to access lower levels

Source: Roskill / Company Reports

1. December 2010 Reserves & Resources up to 2700'

Source: MDN Inc.

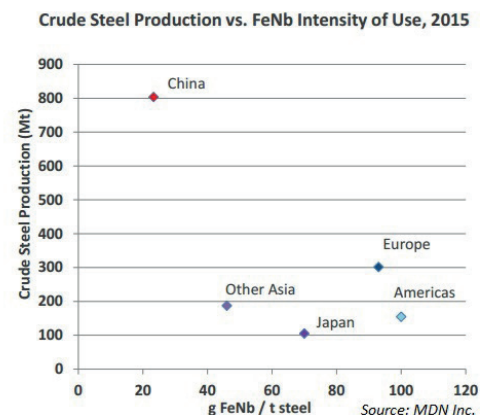
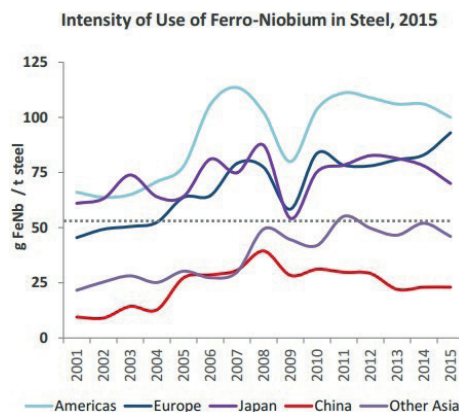
FeNb Prices in Local Currencies Remained Stable over the last 2 Years while the Strong USD pushed the Overall Price in USD down



Source: Camet Metallurgy Inc

Source: MDN Inc.

Niobium Demand expected to grow significantly as Chinese Steel Production moves toward Added Value Steels. China produces half of the world steel



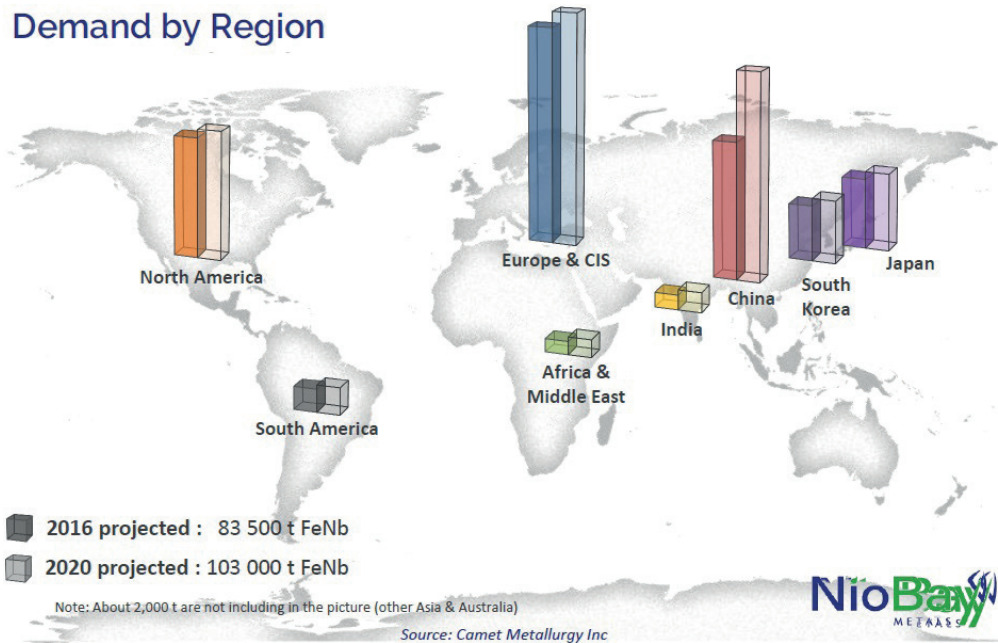
Source: MDN Inc.



Ferro-Niobium Consumption by Region/Country, 2015



Demand by Region



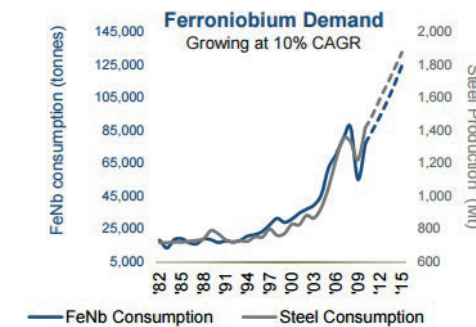
In contrast to other strategic metals and REEs, niobium prices have only corrected marginally since the overall commodity slump started in 2011 and is rather explained with the USD strength. There are no official niobium prices as it is not traded on any metal exchange. Its price is determined solely by negotiation between buyer and seller.

In contrast to other strategic metals and REEs, niobium is not controlled by China; for instance: *"China controls most of the world's molybdenum and the country has taken advantage of this, flooding the market with supplies when international producers became a threat and then charging exorbitant prices for exports once the country has resumed its control of the metal's supply. This has caused some massive fluctuations in the commodity's price..."* ([source](#))

Brazil has the world's largest niobium reserves (98.5%), followed by Canada (1%) and Australia (0.5%). Brazilian niobium reserves total about 840 million t of Nb₂O₅, with an [average grade of 0.73%](#). The only 2 Brazilian niobium mines are Araxá and Catalão with [reserve grades of about 1.2% Nb₂O₅](#) (resources at 0.93% Nb₂O₅).

Most of the current exploration, development, and operating mines for niobium have grades between **0.3% and 1.2% Nb₂O₅** (apart from Araxa averaging 2.5% Nb₂O₅).

Niobium Demand is Rapidly Growing

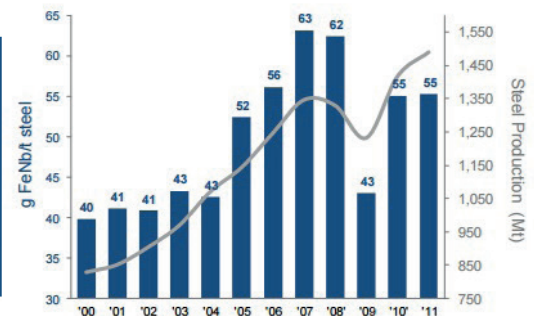


- ~ 60% of FeNb growth generated by increased intensity; balance is in growth of crude steel production
- 20% of steel produced in developed countries is HSLA; only 10% in developing countries
 - HSLA prod'n will continue to increase in both developed and developing countries (HSLA in automobiles will double by 2020)

Growth in:

- Crude Steel
- HSLA steel production increase
- Intensity Usage

Is forecast to generate a CAGR of 10 to 11% for FeNb over the next 5 years

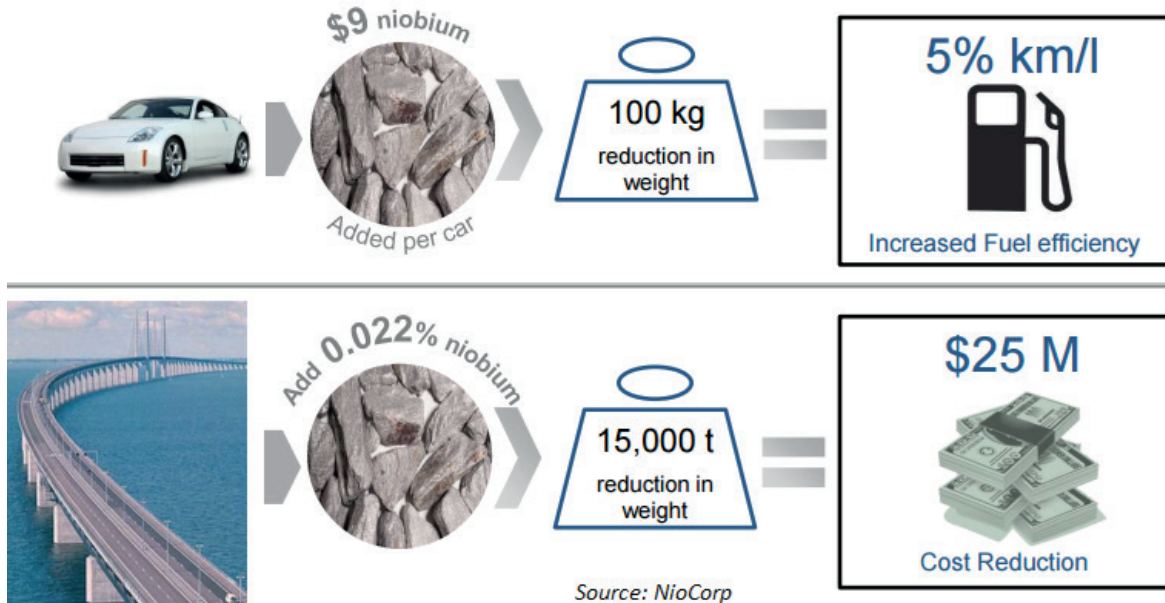


Niobium Pricing

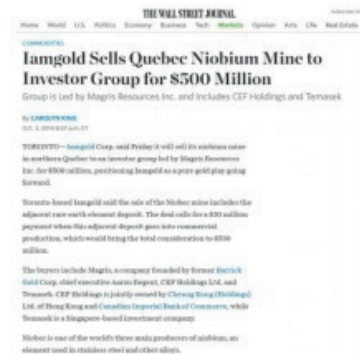
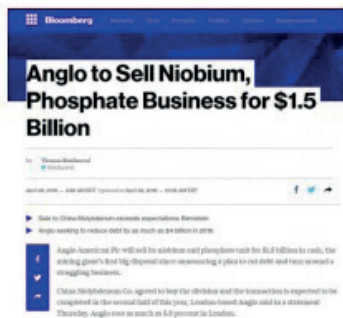




Niobium Provides Significant Cost Benefits



Recent Niobium Transactions





The Commodity That No One Knows About But Everybody Wants to Buy

By Thomas Biesheuvel and Jesse Riseborough on May 18, 2016, for [Bloomberg](#)

Niobium is used in steel and 7 times more valuable than copper

China outbids 15 companies for rare chance to own Brazil mine

The world's mines and steel plants got so devalued during the commodity slump that some were just given away by owners struggling to cut losses or debt. But there's at least one metal that's been attracting a lot of attention.

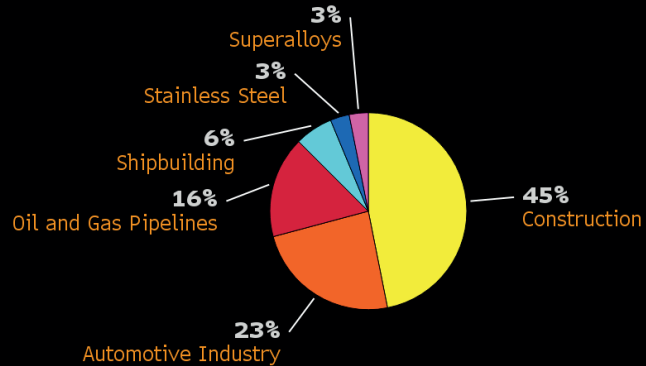
Niobium -- named for a Greek goddess who became a symbol of the tragic mourning mother -- is used to produce stronger, lighter steel for industrial pipes and aircraft parts. It is mined in only three places on Earth, and the price of every kilogram is seven times higher than copper.

China Molybdenum Co. outmaneuvered at least 15 companies last month to purchase Anglo American Plc's niobium and phosphate unit in Brazil, agreeing to [pay](#) \$1.5 billion, or 50 percent more than the valuation by some analysts. The buying frenzy that included Vale SA, Apollo Global Management LLC and X2 Resources showcased the growing appeal of a market that may be worth \$4 billion for a soft, silvery metal many experts don't know much about.

"I didn't know what niobium was, and I had been in the minerals industry for 20 years before this opportunity came across my desk," said Craig Burton, the chairman of Cradle Resources Ltd., which is seeking to [develop](#) the \$200 million Panda Hill niobium project in Tanzania. "I had to actually open up the periodic table just to double-check that it was an element. It definitely is a boutique space."

Why We Need Niobium

The world depends on niobium for stronger, lighter steel



Source: NioCorp

Bloomberg

Niobium is hard to find and hard to value. More than 80 percent of global supply comes from one company -- Cia. Brasileira de Metalurgia & Mineracao in Brazil. Metal Bulletin Ltd., which publishes prices for metals as obscure as bismuth and germanium, says there's not enough liquidity to report one for niobium.

The metal averaged about \$40 a kilogram last year, according to Cradle Resources, which is based in Perth, Australia. An equivalent amount of copper on the London Metal Exchange fetched about \$5.49. Global demand for niobium is about 90,000 to 100,000 metric tons annually.

Three Mines

Still, prices fell last year because of the weak demand for steel, as slumping oil and gas markets led to fewer metal pipe purchases, according to Anglo American, which wants to raise cash to cut debt after a collapse in commodity prices. Almost all the metal comes from just three mines in Brazil and Canada, allowing dominant producer CBMM to match supply to demand and influence prices.

Among the companies outbid by China Molybdenum were Mosaic Co., the world's largest producer of phosphate fertilizer, South32 Ltd. and Eurochem Group AG, people familiar with the process said. The sale was highly competitive, said two people involved, who asked not to be identified because the matter was private. The winning offer exceeded the estimates of analysts at Bank of America Corp. and Investec Plc. RBC Capital Markets said the assets were among the best that London-based Anglo has [offered](#).

Very Unique

What makes the business so attractive is that there are only a few operating mines. Anglo and Niobec account for about 9 percent of production, and Brazil's CBMM supplies the rest, according to Argonaut Securities Pty. Both the U.S. and Europe list niobium as a strategically important mineral.

"Niobium is a very unique business," said Kalidas Madhavpeddi, who heads the CMOC International unit of Luoyang, China-based China Molybdenum. "We typically want to buy from people who regret selling it. We've been very

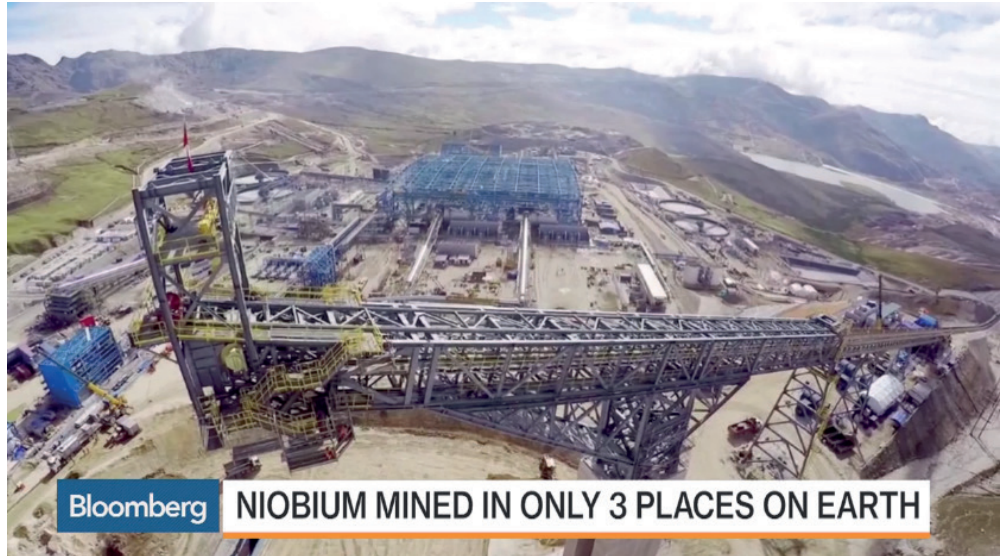


carefully assembling a war chest in anticipation of a downturn in the industry.”

CBMM, controlled by the billionaire Moreira Salles family, has mostly dominated supply since starting operations five decades ago. It sold a 30 percent stake to a group of Asian steelmakers in two transactions valued at \$3.9 billion in 2011.

In another deal, Magris Resources Inc., founded by former Barrick Gold Corp. Chief Executive Officer Aaron Regent, agreed to pay \$530 million for the [Niobec mine](#) in Canada in 2014.

Unsuccessful bidders in Anglo’s sale may turn their interest to Cradle’s Panda Hill project in Tanzania, Argonaut said in a research report. Pending financing, it’s expected to start producing in mid-2018.



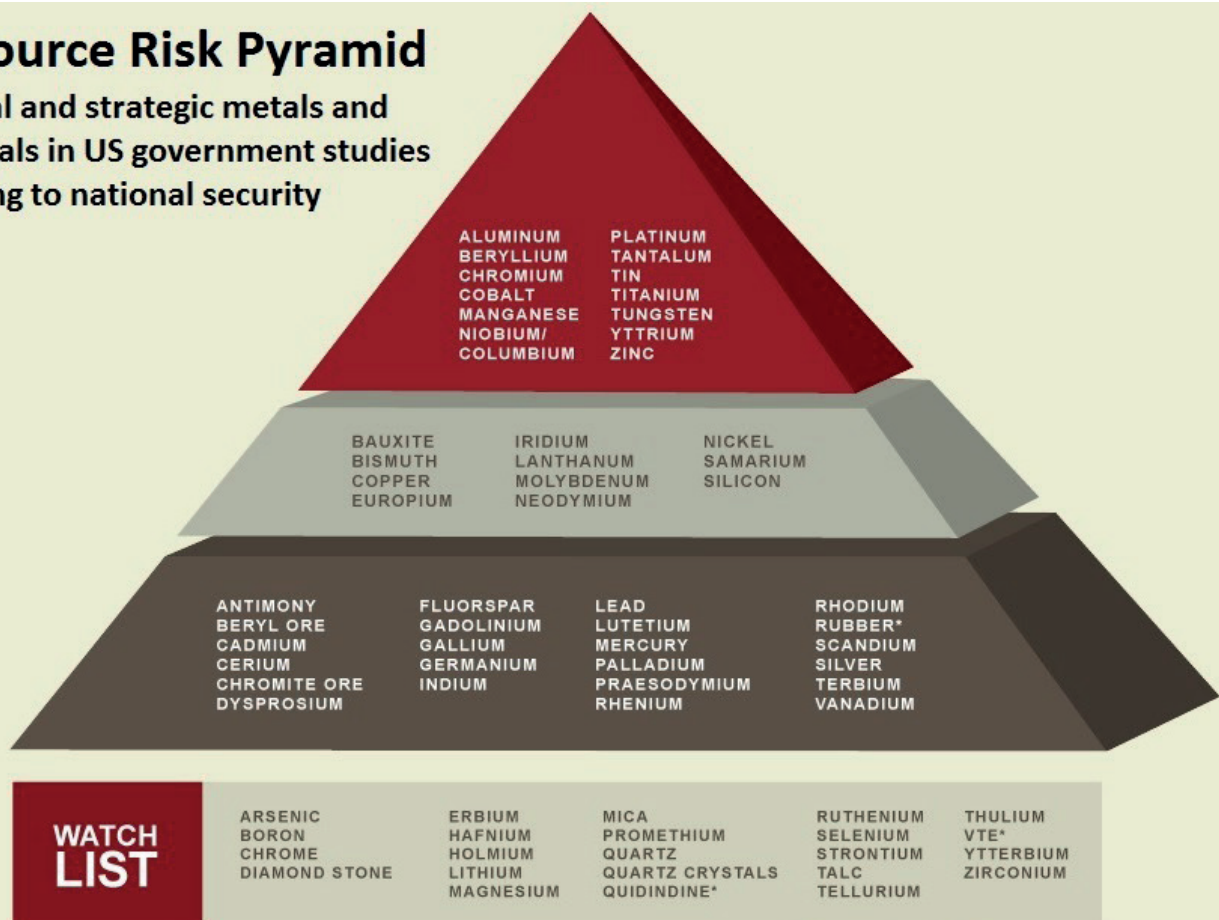
Click on image (or [here](#)) to watch interview with Bloomberg reporter Thomas Biesheuvel

Cradle shares jumped 8.6 percent in Australian trading, reaching the highest since 2011. The sales “have brought a lot of participants in,” Cradle’s Burton said.

“There was only one winner. That leaves lots of parties that might be interested in talking to us because we do need to raise some capital to bring this project on.”

Resource Risk Pyramid

Critical and strategic metals and minerals in US government studies relating to national security



* NOT TECHNICALLY MINERALS, THEREFORE OMITTED IN FURTHER CALCULATIONS

Source: AmericanResources.org



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Stephan Bogner studied at the



International School of Management (Dortmund, Germany), the European Business School (London) and the University of Queensland

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