

Rare Earth Metals

“America’s Achilles Heel”



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The Backbone of Green Technologies

- ☞ Rare Earth Metals are a diverse group of 15 Lanthanides plus Yttrium and Scandium; each of which is a critical metal for green technologies.

Periodic Table of the Elements

1 H Hydrogen 1.008																	2 He Helium 4.003
3 Li Lithium 6.941	4 Be Beryllium 9.012											5 B Boron 10.811	6 C Carbon 12.011	7 N Nitrogen 14.007	8 O Oxygen 15.999	9 F Fluorine 18.998	10 Ne Neon 20.180
11 Na Sodium 22.990	12 Mg Magnesium 24.305											13 Al Aluminum 26.982	14 Si Silicon 28.086	15 P Phosphorus 30.974	16 S Sulfur 32.06	17 Cl Chlorine 35.453	18 Ar Argon 39.948
19 K Potassium 39.098	20 Ca Calcium 40.078	21 Sc Scandium 44.956	22 Ti Titanium 47.867	23 V Vanadium 50.942	24 Cr Chromium 51.996	25 Mn Manganese 54.938	26 Fe Iron 55.845	27 Co Cobalt 58.933	28 Ni Nickel 58.693	29 Cu Copper 63.546	30 Zn Zinc 65.38	31 Ga Gallium 69.723	32 Ge Germanium 72.631	33 As Arsenic 74.922	34 Se Selenium 78.96	35 Br Bromine 79.904	36 Kr Krypton 83.798
37 Rb Rubidium 85.468	38 Sr Strontium 87.62	39 Y Yttrium 88.906	40 Zr Zirconium 91.224	41 Nb Niobium 92.906	42 Mo Molybdenum 95.94	43 Tc Technetium 98.907	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.906	46 Pd Palladium 106.42	47 Ag Silver 107.868	48 Cd Cadmium 112.411	49 In Indium 114.818	50 Sn Tin 118.710	51 Sb Antimony 121.760	52 Te Tellurium 127.6	53 I Iodine 126.905	54 Xe Xenon 131.29
55 Cs Cesium 132.905	56 Ba Barium 137.327	57-71 Lanthanide Series	72 Hf Hafnium 178.49	73 Ta Tantalum 180.948	74 W Tungsten 183.84	75 Re Rhenium 186.207	76 Os Osmium 190.23	77 Ir Iridium 192.222	78 Pt Platinum 195.085	79 Au Gold 196.967	80 Hg Mercury 200.592	81 Tl Thallium 204.387	82 Pb Lead 207.2	83 Bi Bismuth 208.980	84 Po Polonium [209]	85 At Astatine [210]	86 Rn Radon [222]
87 Fr Francium [223]	88 Ra Radium 226.025	89-103 Actinide Series	104 Rf Rutherfordium [261]	105 Db Dubnium [262]	106 Sg Seaborgium [266]	107 Bh Bohrium [264]	108 Hs Hassium [269]	109 Mt Meitnerium [268]	110 Ds Darmstadtium [269]	111 Rg Roentgenium [272]	112 Cn Copernicium [277]	113 Nh Nihonium [284]	114 Fl Flerovium [285]	115 Mc Moscovium [288]	116 Lv Livermorium [293]	117 Ts Tennessine [294]	118 Og Oganesson [294]
57 La Lanthanum 138.905	58 Ce Cerium 140.116	59 Pr Praseodymium 140.908	60 Nd Neodymium 144.242	61 Pm Promethium 144.913	62 Sm Samarium 150.36	63 Eu Europium 151.964	64 Gd Gadolinium 157.25	65 Tb Terbium 158.925	66 Dy Dysprosium 162.500	67 Ho Holmium 164.930	68 Er Erbium 167.259	69 Tm Thulium 168.934	70 Yb Ytterbium 173.055	71 Lu Lutetium 174.967			
89 Ac Actinium [227]	90 Th Thorium 232.038	91 Pa Protactinium 231.036	92 U Uranium 238.029	93 Np Neptunium 237.048	94 Pu Plutonium 244.064	95 Am Americium 243.061	96 Cm Curium 247.070	97 Bk Berkelium 247.070	98 Cf Californium 251.080	99 Es Einsteinium 252.083	100 Fm Fermium 257.103	101 Md Mendelevium 258.10	102 No Nobelium 259.108	103 Lr Lawrencium 260.10			
Alkali Metal	Alkaline Earth	Transition Metal	Basic Metal	Semimetal	Nonmetal	Halogen	Noble Gas	Lanthanide	Actinide								

China has a “Dual” Rare Earth Monopoly



- ☞ *“The Middle East has oil, China has rare earths” – Deng Xiaoping*
- ☞ There is a lack of fully integrated value chains outside China;
- ☞ China dominates rare earth metal mining *and* metallurgical processing of finished products, responsible for 95% of global output;
- ☞ Recently introduced “American Mineral Security Act” seeks to address this issue.

China's Trade War "Trump Card"

- ☞ From the 1960s to the 1980s, the United States was the leader in global rare earth production;
- ☞ By 2008, China accounted for more than 90% of world production of REE;
- ☞ In 2010, China cut off REE exports to Japan;
- ☞ In May 2019, China threatened to "weaponize" REE by cutting off supply to the United States;
- ☞ July 12 Reuters report states United States Pentagon pushing for REE supply outside of China.



A Bedrock National Security Issue



- ☞ The **United States Department of Defense** (“DoD”) depends on rare earth materials to provide functionality in weapon system components;
- ☞ There is a growing call for the DoD to advocate forceful support of domestic rare earth supply lines because the performance of weapons of war are a matter of life and death.

Rare Earths in High Demand

- ☞ Magnets made of REE often represent only a small fraction of the total weight; however, the products and systems in which they are used would not function without them;
- ☞ REE are indispensable in electric cars and Tesla recently switched to a magnetic motor using neodymium in its Model 3;
- ☞ We are only at the very beginning of our understanding of the rare earth story, especially the wide-ranging properties, various types of alloys and the host of technology products made possible by REE.

Rare earth minerals

Group of 17 elements used in a wide range of consumer products

Features:

▶ Gray to silvery metals

▶ Soft, malleable and ductile

China supplies at least 95 percent of world's rare earths

Some products that contain rare earth elements:

■ **iPods**
dysprosium, neodymium, praseodymium, samarium, terbium

■ **Wind turbines**
dysprosium, neodymium, praseodymium, terbium

■ **Hybrid vehicles**
dysprosium, lanthanum, neodymium, praseodymium

■ **Fibre optics**
erbium, europium, terbium, yttrium

■ **Energy-efficient fluorescent light bulbs**
europium, terbium, yttrium

Source: USGS

AFP



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I saw some people still don't believe China could restrict rare earth exports to the US, deeming the move will hurt China as well. They just don't understand China, including how information disclosure works in China.

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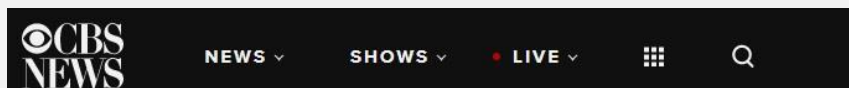
Shares of rare earth miners skyrocket after Beijing threatens to cut off the minerals



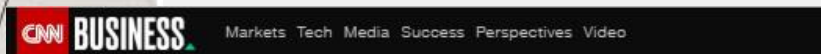
China Doesn't Want to Play by the World's Rules

Beijing's plans are much bigger than the trade war.

BY ABIGAIL GRACE |



As trade war heats up, China threatens clampdown on "rare earths"



Rare earths could be the next front in the US-China trade war.



By Sherisse Pham and Julia Horowitz, CNN Business
Updated 9:00 AM ET, Thu May 30, 2019



China gears up to weaponize rare earths in trade war

China is the world's biggest producer of rare earths and supplies about 80 per cent of U.S. imports



The McCoy Project

Marathon, Ontario



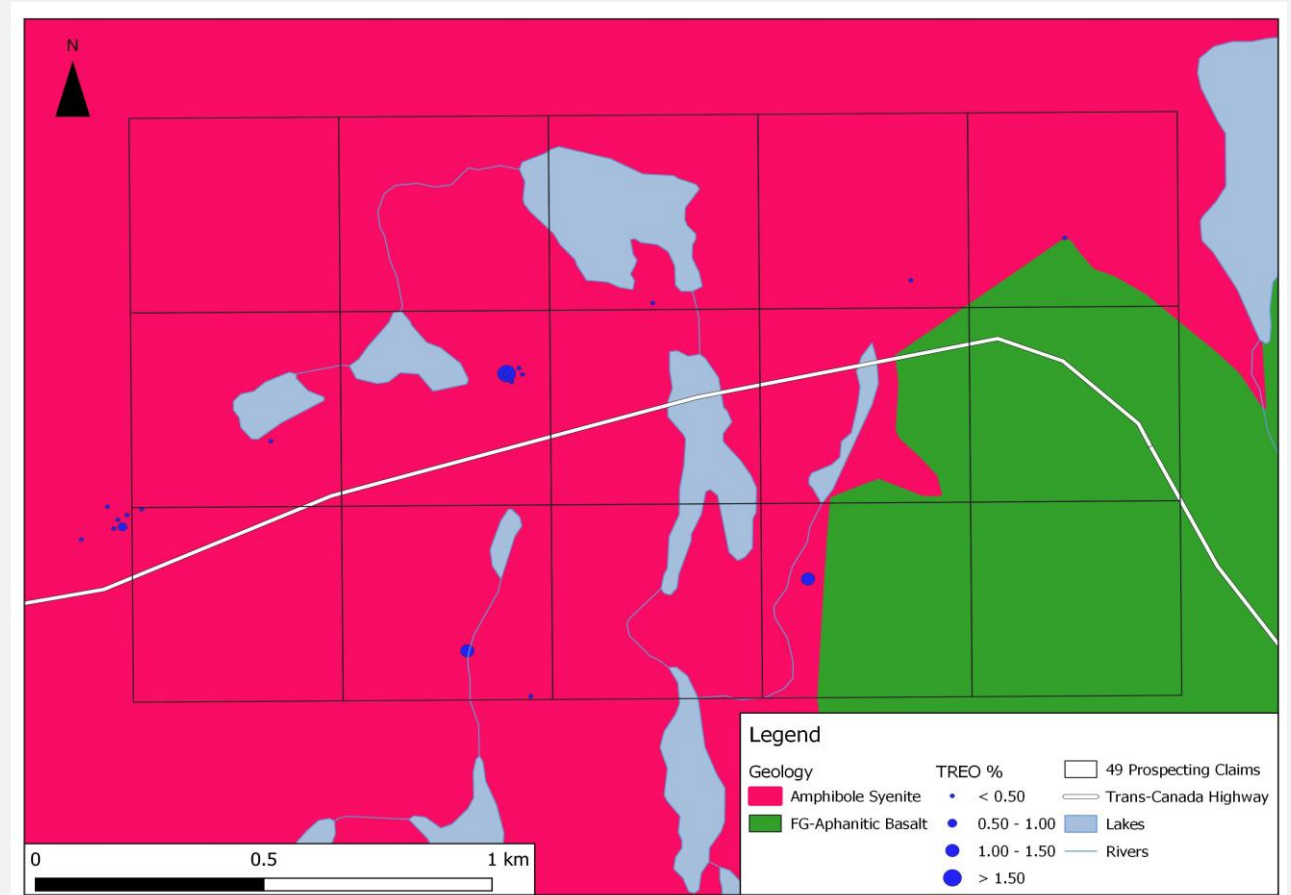
The “REE” McCoy – Favourable Location

- ☞ Located along the Trans-Canada Highway, 200 kms from Thunder Bay, Ontario and less than 20 kms from Marathon;
- ☞ Easy-access for low-cost exploration;
- ☞ The property consists of 15 claim units covering 240 hectares;
- ☞ Mining-friendly jurisdiction with Hemlo Mine a short distance to the east.



The “REE” McCoy – Favourable Geology

- Samples assaying up to 3.967% TREO and up to .0277% Ta_2O_5 , 1.29% Nb_2O_5 and 5.17% ZrO_2
- Previous government workers noted the presence of rare earth mineralization in coarse-crystalline amphibole syenite in proximity to basaltic xenoliths;
- REEs are associated with a late-stage carbonate phase that crystallized bastnaesite, synchysite, and pyrochlore;
- The property contains the contact between a large basaltic xenolith and amphibole syenite making the property highly prospective.



The “REE” McCoy – How Does it Stack Up?

Company	FortyNine Prospecting	Molycorp	Hastings	Lynas	Peak Resources	Alkane	Greenland
Project	McCoy* <i>*based on three samples *may not be representative of the property as a whole</i>	Mountain Pass	Yangibana	Mount Weld	Ngualla	Dubbo	Kvanefjeld
Lanthanum	21.8%	33.2%	10.0%	25.2%	27.6%	19.5%	27.7%
Cerium	38.7%	49.1%	39.6%	46.4%	48.2%	36.7%	36.1%
Praseodymium	3.6%	4.3%	8.0%	5.4%	4.7%	4.0%	4.5%
Neodymium	11.2%	12.0%	33.8%	18.8%	16.6%	14.1%	13.7%
Sub-Total NdPr	14.87%	16.30%	41.82%	24.17%	21.33%	18.10%	18.19%
Samarium	2.0%	0.8%	3.9%	2.3%	1.6%	2.2%	3.0%
Europium	0.1%	0.1%	0.8%	0.5%	0.3%	0.1%	0.2%
Gadolinium	1.6%	0.2%	1.8%	0.9%	0.6%	2.2%	1.8%
Terbium	0.3%	0.0%	0.1%	0.1%	0.1%	0.3%	0.3%
Dysprosium	2.3%	0.1%	0.5%	0.2%	0.1%	2.1%	1.4%
Yttrium	13.7%	0.1%	1.1%	0.5%	0.2%	15.8%	10.1%
Others	4.6%	0.1%	0.3%	0.1%	0.0%	0.0%	1.3%

The “REE” McCoy - Next Exploration Steps are Low-Cost and Clearly Defined

- ☞ Follow up on government mapping to determine the extent of prospective rocks;
- ☞ Prospect around areas where high-grade samples were previously collected, covering property more thoroughly;
- ☞ Conduct detailed geophysics.



The “REE” McCoy

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