

# STRATEGIC METALS

*Your monthly guide to the latest information on the world's strategic metals*

## How & Where Manganese & Magnesium is Used

Manganese is found in nature as a free element, in combination with iron and many other minerals. The most important industrial use of manganese is as an alloy, predominantly in the steel industry. In fact, there is no comparative substitute for manganese in its primary applications. Pure magnesium, on the other hand, is not found as a free element because of its highly reactive nature. The primary industrial applications of magnesium are as a component of aluminum and zinc alloys, in the removal of sulfur in the iron and steel-manufacturing sector, and in the production of metals such as titanium.

### Steel Industry

Almost 85–90% of the global manganese production is utilized in the steel industry, where it is used as a desulfurizing and deoxidizing agent by virtue of its ability to combine with sulfur and its powerful deoxidation capacity. Almost all steel contains some amount of manganese but Hadfield steel, which contains 10–15% of manganese, attains a remarkably high tensile strength and is used to make products such as helmets.

Ferromanganese is added to steel to harden and toughen it without making it brittle, and to increase its abrasion resistance. The alloy is produced by heating a mixture of iron oxide and manganese oxide with carbon (coke and coal), in either a submerged arc furnace or a blast furnace where the carbon acts as a reductant. The reaction produces ferromanganese, which contains a high 76–80% of manganese.

Silicomanganese contains about 65–68% of manganese and significantly lower carbon because of the presence of silicon. When its carbon content is less than 0.1%, it is used as a reducing agent to produce low-carbon ferromanganese. Electrolytic manganese is used in products that require manganese in its pure form. Manganese ore is taken through several treatment processes to obtain manganese of almost 99.9% purity.

In the steel industry, magnesium is added with lime and other fillers to liquid iron in the blast furnace where it combines with oxygen and sulfur and improves the mechanical properties of steel. Magnesium is also used in the production of hafnium, uranium, and titanium, and zirconium.

### Aluminum Industry

The aluminum industry is the second largest user of manganese where it is used as an alloying agent. Manganese content of about 1.5% increases the corrosion resistance of aluminum. Aluminum alloys with a manganese content of 0.8–1.5% are used to

manufacture beverage cans. Copper too can be strengthened with the addition of manganese.

Magnesium is the lightest known structural metal. It is lighter than aluminum and that makes it invaluable as an alloying element with aluminum. Magnesium is the only metal that can be added to aluminum to harden it without increasing its specific gravity. Magnesium added to aluminum also increases its corrosion resistance.

### Dry Cell Batteries

Manganese dioxide is largely used as a depolarizer in dry cell batteries. Although found naturally, manganese dioxide is synthetically produced by the electrolysis of reduced manganese ore. This use of manganese dioxide is on the decline as people are turning to lithium ion batteries.

The electronegative nature of magnesium makes it useful in the manufacture of dry cell batteries. Magnesium also plays a role in the electronic device industry where it is used in the manufacture of mobile phones, cameras, and laptop computers, among others.

### Other Uses of Manganese

Manganese oxide is used as a fertilizer supplement as well. The oxide obtained by the reduction of manganese dioxide is used in the fertilizer industry. The oxide is easily assimilated by plants and often used in manganese deficient agricultural lands as well.

### Other Critical Uses of Magnesium

Magnesium alloys have a high strength to weight ratio and that makes them very popular in the manufacturing industry, especially in the automotive sector. Leading automobile manufacturers such as BMW, Porsche, the Volkswagen Group and Mitsubishi Motors have been using magnesium in their cars for its lightweight nature that lends itself to great speeds. The aerospace industry is increasingly turning to magnesium too for the same two qualities.

Magnesium alloys are also used to manufacture portable equipment and parts that are subject to frequent changes in position. The excellent machinability of the alloys and their relatively lower cost are other reasons for their popularity.

Magnesium has a very high affinity for oxygen, rendering it the strongest deoxidant available. In a finely divided condition, its affinity for oxygen makes magnesium burn with a bright white light and intense heat. It is because of this property that it is used in flash photography and pyrotechnics.

To sign-up and receive this report via e-mail each month, visit [www.CriticalStrategicMetals.com](http://www.CriticalStrategicMetals.com)

# STRATEGIC METALS

Your monthly guide to the latest information on the world's strategic metals

## First Month of Van Eck's REMX ETF

In late October, Van Eck Global launched the first listed exchange-traded fund (ETF) in the United States – the Market Vectors Rare Earth/Strategic Metals ETF (NYSE Arca:REMX), which aims to expose investors to companies involved in the production, refining, and recycling of rare earth/strategic metals. The fund seeks to reproduce, as far as possible, the price and yield performance of the Market Vectors Rare Earth/Strategic Metals Index (Index), which enables investors to track the overall performance of listed companies in that sector. To be listed in the Index, a company must earn over 50% of its revenue from ventures in the rare earth/strategic metals space.

The Index includes both rare earths and strategic metals, a group that includes 49 elements in the periodic table. Strategic metals are utilized in applications such as jet engines, cell phones, hybrid cars, wind turbines, and steel alloys, while the subset of 17 rare earth metals are chemical elements that play a critical role in several technological products, especially in electronics.

As has been repeatedly reported, China is the world's largest producer of rare earth metals, accounting for about 97% of the global production. However, the Index lists equities that are available to non-Chinese investors as well, which is why only offshore Chinese equities or H-shares are included in the Index. As per the latest data, the Index includes 24 companies based in eight countries. China has the fourth highest presence (14.84%) after Australia, Canada and the US.

The first day of trading saw the share prices of REMX and other rare earth companies fall in the wake of a report that said that China had called off the unofficial halt of rare earth

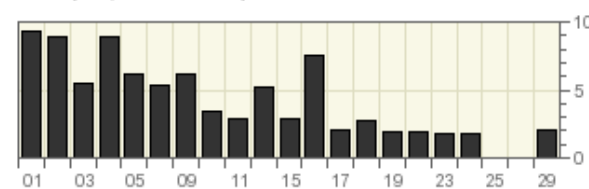
shipments to Europe, Japan, and the US. Prices later stabilized but trading still ended at a level about 4.6% lower than at the start.

Principal Jan van Eck of Van Eck Global said, "We believe REMX offers investors balanced exposure to the sector first by including strategic metals as well as rare earths and second by including processors and recyclers, not just mining companies. An additional advantage is that the underlying index caps exposure to any company at 8%; this limit prevents any particular company from having an undue effect on the ETF."

Stock Price in Dollars NYSE Arca:REMX



Volume (100,000s of shares)



NYSE Arca:REMX on November 30th/2010  
Provided by NYSE Technologies Global Market Data.

Van Eck has pointed out that like all investments, investing in the rare earths/strategic metals industry has its own share of risks, which include environmental concerns and geopolitical issues. Since China plays such a huge role in the industry, any policy change in China can affect the Index. The recent furor over China tightening its export quota resulted in a sharp price hike in the shares of small non-Chinese rare earth mining companies. Further, most of the rare earth companies are small or medium-sized and are highly sensitive to the availability of capital. Not to forget, share

prices and metal prices can both be volatile.

Analysts are of the opinion that REMX is new and operating with an unproven methodology. The listed companies are rather risky with more promises than actual operating histories. However, trading has been active in spite of the risks involved. Analysts believe that regardless of the risks, the rare earth theme cannot be ignored and the Index is an entity worth observing.

To sign-up and receive this report via e-mail each month, visit [www.CriticalStrategicMetals.com](http://www.CriticalStrategicMetals.com)

# STRATEGIC METALS

*Your monthly guide to the latest information on the world's strategic metals*

## Investing in Chinese Rare Earth Mining Companies

During the recent de facto ban on the export of rare earth shipments to Japan by China, what almost went unnoticed is the fact that the ban was only on raw materials and not on finished goods that utilized rare earths sourced from China. This is viewed as a move by China to force foreign buyers to purchase China's manufactured goods in addition to the raw materials.

Economist Paul Krugman, while not sympathetic to the Chinese cause, blames the US and other advanced economies for getting themselves into such a position of dependence. He has pointed out that one way of breaking free is to do what the Japanese are doing – recycle rare earth metals, or get innovative and design products that do not require rare earths.

While China's moves are creating panic in the rare earth sector, it cannot be denied that unless China

conducts its business on a more transparent mode, its efforts to monopolize the sector will backfire since the nation's policy makers seem to have failed to realize that such high-handed measures are uniting the rest of the world against China. Business partners and prospective investors will insist on tougher terms of contract or develop other ways to protect their business interests.

The Chinese government has meanwhile stepped up efforts to restructure the rare earth industry and has introduced favorable policies, and is encouraging acquisitions and mergers to restructure the sector. According to plans, the Chinese government will bring down the number of rare earth companies from 90 to 20 within 2015.



Refineries owned by Inner Mongolia Baotou Steel Rare Earth High-Tech Company, which supplies 46 percent of the global rare earth market.  
Photo by Feng Yongbin / China Daily

Managing Director William Majcher of Hong Kong based investment bank Baron International Limited put to rest fears that China does not encourage foreign investment in its rare earths industry. He said, "People think they can't get involved in the upstream or downstream of rare earths, but that's not the case. You've got to follow a specific path, but it can be done."

He speaks from a position of authority since Baron is an adviser to the Baotou City Development Reform Commission, which houses the Inner Mongolia Baotou Steel Rare Earth Hi-Tech Co. – China's single largest producer of rare earth metals.

The rare earth sector is attracting several new players into the sector. In September 2010, China's leading mining company, the Beijing based Aluminum Corporation of China, Limited (NYSE: ACH) (Chalco),

announced plans to invest \$1.5 billion to develop rare earth resources in China. With that amount, Chalco would acquire a major stake in Jiangxi Rare Earth and Rare Metals Tungsten Group (JXTC) – China's largest producer of tungsten with interests in rare earths.

As non-Chinese companies scramble to find new sources of rare earth metals, a few mining companies such as the US based Molycorp Minerals and the Canada based Rare Element Resources have had their fortunes boosted by China's controlling policies. However, analysts don't tire pointing out the difficulties faced by new rare earth ventures, both in terms of infrastructure and finances. Chinese rare earth companies will continue to rule the market until production begins, which is unlikely to happen before 2015 at the earliest.

To sign-up and receive this report via e-mail each month, visit [www.CriticalStrategicMetals.com](http://www.CriticalStrategicMetals.com)