CRITICAL
STRATEGIC METALS

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

Japan & China Continue Their Rare Earth Dance

According to a late January Japanese news report, a Japan-China friendship association of Okinawa Prefecture signed an agreement with its Chinese counterpart at Huhhot in Inner Mongolia under which both parties agreed to cooperate in businesses involving rare earths. However, an official in charge of the Chinese People's Association for Friendship with Foreign Countries in Inner Mongolia autonomous region has declared that all such reports are fraudulent and it signed no such agreement during the associations' visit to Inner Mongolia. He said there was no mention of rare earths during the visit. The Japanese association has reportedly since then issued an apology for the reports.

While the two nations are exchanging sharp words over rare earths, the Japanese government has announced plans to spend $65 million in subsidies over the next few years to help Japanese companies reduce their use of dysprosium and neodymium while encouraging recycling and development of alternate materials. The two metals are used by Toyota Motor Corp in wind turbines and hybrid cars, by Apple Inc. in iPads, by Raytheon Co. in missiles and by Boeing Co. in helicopter blades.

Kenichi Hasehira, an official at the Japanese ministry's nonferrous metals division said, "After two years, we expect demand for dysprosium to be cut by about 200 metric tons and demand for neodymium by about 1,000 tons a year from this program." He also said, "All domestic makers of high-power magnets that use dysprosium have applied for the scheme."

Most of these efforts have been in response to China's tight grip on the global rare earth market. China's rare earth export quotas and other restrictions have come under a lot of flak from the international audience in recent times with the EU, Mexico and the US filing complaints with the WTO that China's pricing policies on raw materials, including magnesium and bauxite, violate international trade agreements. While China continues to maintain that its export restrictions are necessary to meet the nation's domestic demand and to protect the environment, the WTO considers the argument illegitimate and has stated that China has been "unable to demonstrate" the benefits of its policies on the environment. Although the ruling does not include rare earth metals, analysts hope to see China change some of its rare earth policies as well.

Michael Silver, CEO of American Elements, said the ruling "confirms the existence of the two-tiered price structure that has caused so much concern." He expressed his belief that the ruling would force China to change its restrictions. However, many analysts involved in the rare earth market are not so hopeful and feel that with China's strong hold over 95% of the global rare earth market, they could easily ignore any future decisions of the WTO.

On the other hand, rare earth stocks displayed uncharacteristic positive pricing trends in January and February in spite of a weak demand marking the end of 2011. In fact the Market Vectors Rare Earth/Strategic Metals ETF recorded a high 18.6% rise in January.

Meanwhile on February 2, Lynas Corp received approval for its advanced materials plant (LAMP) at Gebang in Malaysia. The facility, along with others expected to come onstream over the next few years, may bring about a ten-fold increase in non-Chinese rare earth output between now and 2016. Initial annual capacity of the Lynas plant is expected to be 11,000 tonnes of rare earth oxide (REO) and that is eventually expected to ramp up to 22,000 tonnes per year.

Other experts predict that non-Chinese REO production could reach 60,000 tonnes per year by 2016 while demand could be at 55,000 tonnes per year. Such a surplus could once again bring down prices and rock the boats of the hundreds of rare earth companies operating in the market.

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The Great Graphene Race

UK's Engineering and Physical Sciences Research Council (EPSRC) and the Technology Strategy Board (TSB) will soon invest £50 million, subject to conditions, in graphene research and technology and help establish the UK as a research hub of the wonder material. The effort is expected to result in the quick commercialization of graphene technologies in the UK.

David Willetts, UK's Minister for Universities and Science, said, "This significant investment in graphene will drive growth and innovation, create high-tech jobs and keep the UK at the very forefront of this rapidly evolving area of science. With a Nobel Prize and hundreds of published papers under their belts, scientists in the UK have already demonstrated that we have real strengths in this area. The graphene hub will build on this by taking this research through to commercial success."

EPSRC Chief Executive, Professor David Delpy, said, "The applications for commercial use of graphene are vast, including the creation of new materials and the manufacture of innovative electronics. The £50 million in additional funding is an important step in ensuring we can reap the benefits of those applications." He added, "The race to be the first country to produce commercial products is well and truly on."

The focus on graphene technologies is not a monopoly of the UK; several nations are spending millions of dollars to benefit from the extraordinary properties of the mineral and to develop viable techniques of producing graphene in the forms required to manufacture applications.

Researchers have been struggling to develop a scalable and simple technique to create graphene patterns for new electronic applications. Researchers from several institutes and universities in South Korea have jointly developed a technique whereby several steps involved in the long-used but complex method of lithography have been eliminated. This could result in the low-cost but large-scale production of graphene patterns for many types of electronic devices. Professor Kwang Suh of Korea University said, "This process provides a scalable and compatible methodology for the large-scale and roll-to-roll production of graphene patterns."

Meanwhile, researchers at Sweden's Chalmers University have developed a graphene-based transistor design that would allow more compact RF electronics leading to faster circuits. The university's G-FET (graphene field-effect transistor) could result in applications operating in the terahertz range. Such a range is useful in radio astronomy, radar, and process monitoring.

Nashville's Vanderbilt University researchers said that graphene is five times thinner than conventional anti-corrosion coatings while also being just as effective and transparent. Using the anti-corrosion properties of graphene is not very difficult either. It can be applied by just rubbing a piece of graphite over the surface to be protected. The research report notes, "nickel surfaces coated with four layers of mechanically transferred graphene corrode four times slower than bare nickel."

The anti-corrosion strength of graphene was studied by growing a one-atom-thick layer of graphene on a copper piece, which corroded seven times slower than usual. This technique could be utilized in products that would benefit from graphene's small size, weight and transparency such as copper interconnects in computer chips, designer goods, high-tech equipment (aerospace, super cars, etc.) and implantable medical devices.

The significance of this find is quite important since the anti-corrosion materials market is a serious market in the US. A 2002 study reported that the total corrosion cost across the US was $276 billion, almost equal to its military spend.

Among other research developments, researchers from the University of Wollongong (UOW) have shown that graphene can be used to toughen carbon nanotubes in polymer composites to obtain fibers that are exceptionally tough. The production method promises to be cheap and easy to up-scale. Other studies have proved that graphene oxide has a strong future in many biological processes such as DNA and protein analysis, drug and gene delivery, and also intracellular tracking.

Financial research company Technavio predicted late last year that investing in graphene will produce a CAGR of 58.7% during the 2015–2020 period. The challenge currently is in developing cheaper production techniques. The company listed graphene as a promising investment opportunity that would be difficult to beat over the next decade. The rapid developments indicate the industry is well aware of the potential of the material and is leaving no stone unturned to rapidly commercialize graphene applications.

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Focusing On The Future

Why Molycor Gold Corp's plans to build a World Class magnesium facility in the U.S. should be on your radar

Anthony David: How did an exploration company exploring for gold end up with a magnesium project?

Ed Lee: In 2007, the Company began drilling to test gold anomalies between the shale formations and intersected a large dolomite block. The results for the precious metals didn't amount to much but there were consistent grades of magnesium listed in the assay sheets.

Ed Lee
President of Molycor Gold Corp.

Anthony: Well dolomite is a common rock and can be found most anywhere. What differentiates the Tami – Mosi dolomite from others?

Ed: The Company sent samples to Teck Global Laboratories for assays and composition testing and the results returned a high purity form of dolomite almost identical to the national standards.

Anthony: So how did the Company identify the process?

Ed: We engaged Hazen research to provide a Phase 1 study identifying the different processes for producing magnesium. Molycor's Consulting Team later confirmed the process path.

Anthony: How did a junior Company like Molycor manage to assemble such an impressive career magnesium Team?

Ed: We received a magnesium consultant to contact from Hazen and a relationship was established. From there contact was made to the various individuals describing the project and what it has to offer. Needless to say the project sold itself as the people involved now see the upside potential the project possesses.

James C. Sever
COO of Molycor Gold Corp.

Anthony: How was the process defined regarding the parameters and specifics agreed upon?

Ed: The project requirements were laid out and the Team collectively defined the design criteria to reflect the potentials for zero waste, reduced emissions, reduced footprint, steady cost controls, low capital risk and higher efficiencies.

Anthony: So what are the uses for magnesium?

James C. Sever: Magnesium is used to make high strength light weight castings in aerospace and automotive

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applications. The growth in consumption has developed as structural components for electronic cameras, computers and mobile phones. Without magnesium as the alloying agent to strengthen aluminum, structural applications ranging from I beams to extrusions would not be possible. Magnesium as an alloying element provides the strength for aluminum beverage containers. Magnesium is used in the steel industry to remove sulfur from the molten metal. Without this treatment, steel would be subject to brittle failure at low temperatures. Most of the things we take for granted in our modern world would not be possible without magnesium.

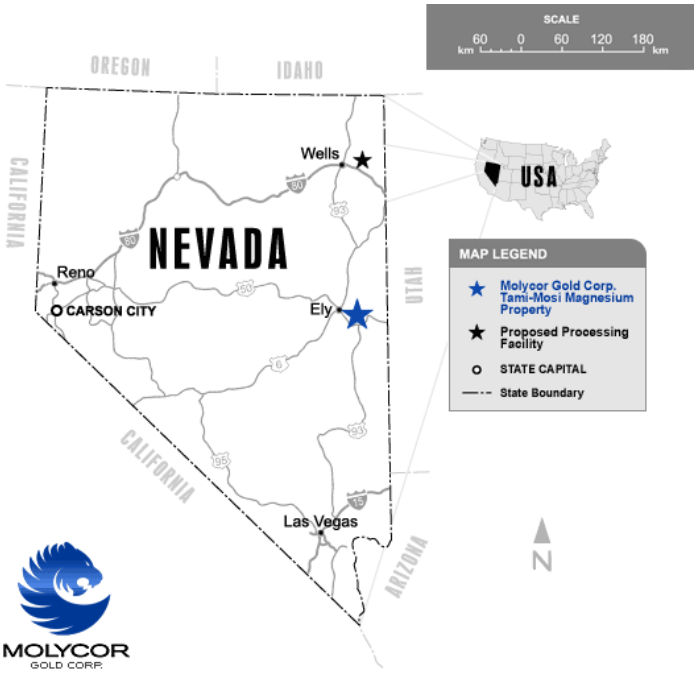
Anthony: Has the magnesium market changed over the years?

James: The world wide sale of magnesium has steadily increased from 170,000 metric tons in the late 1990's to almost 700,000 metric tonnes today. If sufficient suppliers come on line over the next 10 years to meet the demand without driving the price up, the market is expected to continue to grow. One of the driving forces is the new CAFÉ standards for automobiles to meet by 2025.

Anthony: What sort of impact do you expect your project will have on the market?

James: Our predicted startup is 2016. At that time the automotive industry will be looking to increase the content of magnesium in cars in an effort to meet the new CAFÉ standards. All of our supply could easily be used for this purpose. In addition, it is our hope that we will be able to implement some of the predicted areas for improvement which would make our product competitive on the world market.

Anthony: How large is your proposed magnesium project?



James: We just completed a NI 43-101 Preliminary Economic Assessment study and by using a cost versus capacity model we determined that a facility producing 30,000 metric tons of 99.9% magnesium ingots per year would give us optimum productivity for scale of operation.

Anthony: Is your ore deposit capable of sustaining that level of production over an extended period of time – say 30 years?

James: We have inferred resources in excess of 412 million tonnes of high quality dolomite. The consumption of dolomite to satisfy the plants needs for 30 years continuous operation is approx-imately 9 million tons. This means we potentially have over 97% of the dolomite still be available for longevity and possible expansion.

Anthony: I noticed that your reduction facility is separated from your ore body by 120 miles. Isn't it unusual to transport raw ore that far?

James: While performing the economic assessment it became evident that the quantity of raw materials needed to process the ore was much greater than the mass of ore itself. To reduce transportation costs it was necessary to locate the reduction facility on the I-80 corridor. This not only provides highway access but also main line rail access.

Anthony: Does your processing facility only produce magnesium ingot?

James: No this facility is actually three separate units that would normally stand alone. By generating our power through clean coal technology and making our primary raw material, 75% ferrosilicon, we are able to supply electric power at approximately half the cost of that available commercially. In addition we will have syn-gas (synthetic natural gas) and steam also available for use in the plant. Our

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reductant cost will also be significantly lower in cost and will be under our control to ensure the quality standards are met. By locating all three facilities adjacent to one another, we will be able to realize an increase in productivity. For example, in a conventional structure each plant would have a control room operator on duty 24 hours per day. That would actually require 12 people to do the job. By having a consolidated control room we should be able to operate with one operator reducing the man power requirement to 4 people. This concept applies to many other positions.

Anthony: We all know the market for commodity metals such as magnesium is subject to fluctuation and raising large capital can be a challenge. Do you have a strategic plan for operating the plant?

Ed: In the unlikely event that our production costs prevent or reduce the sale of the magnesium ingot under declining market conditions, the process used for making magnesium allows production to be cut back or even curtailed without incurring rebuild and restart costs when the market turns favorable. The interesting aspect is that we would have an economically viable ferrosilicon plant and a power plant. So in theory, if the magnesium price were to decline, the magnesium plant would be shut down and both the power and the ferrosilicon products could be sold into the market on a short term basis and the income used to cover our capital and fixed costs.

Anthony: Why are you using coal as a power source when there's currently there an increasing supply of natural gas?

James: In the course of our economic assessment we made an analysis of utilization of natural gas. Yes the basic cost of the gas is favorable but the infrastructure necessary to deliver the gas to the plant is over subscribed. The resulting high transportation costs combined with the need for construction of a pipeline into the plant resulted in clean coal gasification being the most economic alternative.

Anthony: Are there other methods of producing magnesium?

James: Yes, historically two other approaches have been used:

1. The electrolytic method extracts the magnesium from the rock by leaching and conversion to magnesium chloride which is then electrolyzed, yielding molten magnesium and chlorine. This process is better suited to brucite or magnesite rather than dolomite and the issue of dealing with chlorine and chlorine compounds raise serious environmental issues.

2. Carbon can be used as a reductant of magnesium oxide but is very difficult to recover the magnesium from this process as the metal vapor generated in the reduction furnace has to be immediately quenched to a solid. If the magnesium is cooled during the liquid phase, the carbon monoxide present as a product of the reaction will immediately react with the magnesium producing magnesium oxide and soot. No commercial application of this approach exists today.

Anthony: Does your approach use new technology to produce magnesium?

James: On the contrary, to reduce risk we have designed our plant around a process that has been used since the late 1930's. It is this process that was used to produce the magnesium formed into the engine block used in the VW beetle. Currently the process is in use in Brazil. Other than increasing the scale of the furnace and utilizing modern handling methods, the Brazilian plant is the same as the original Italian facility.

Anthony: So what are the next steps for Molycor?

Ed: Well, we are currently identifying manufacturers and vendors and drafting a detailed schedule for all the tasks needed to take the project through to complete the pre-feasibility report. This will assist us in keeping control of costs and timelines.

Anthony: How long will it take for you to complete the pre-feasibility report?

Ed: We are expecting approximately 14 months and it will begin as soon as the company raises the monies. Remember that we are building a vertically integrated facility. So we want to try and under-promise and over-deliver.

You can learn more about Molycor Gold Corp. and their Tami-Mosi project at:

www.Molycor.com