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Global supply of rare earths impacted by China's export restrictions

by Robert L. Wallack, Freelance Reporter, Beijing

Over the past few years, the government policy of the People's Republic of China (PRC) gradually restricted the export of rare earth elements (REE). The reduction of export quotas is expected to continue and will directly impact the supply of rare earth metals to the rest of the world. As a result, developed countries are pressured to seek new sources of rare earths that are essential to meet the growing demand in order to make clean energy as well as military and high-tech products.

"Currently, the Chinese government strictly controls the export and exploration of rare earths because they are an unsustainable resource of strategic importance to China," according to a spokesperson from the investment department of the Baotou Rare Earth Hi-Tech Development Zone, in an interview with *Resource World* magazine.

The commercial and military applications of these "technology metals," as described by the United States' rare earths expert, Jack Lifton, are immense. Rare

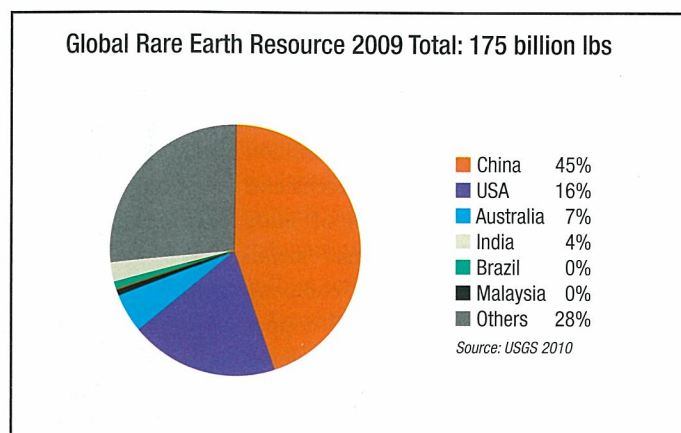
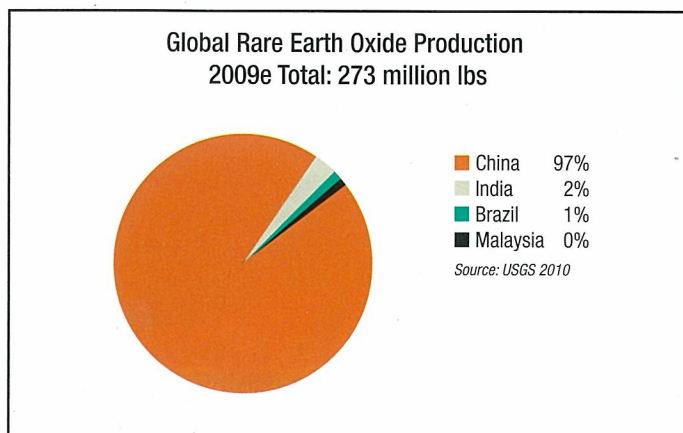
earths are needed for lighter and more durable electric motors in hybrid cars, for wind mill turbines, lighting, laptops, stereo speaker devices, iPhones and in medical equipment for X-ray machines and in magnetic resonance imaging machines to name a few. No less significant are the military applications of rare earths in the production of night vision goggles, range finders, precision guided munitions and cruise missiles.

Besides, these new and yet to be discovered rare earth element applications, they have traditional uses as well. These include the use of REE to remove impurities or strengthen iron and steel in metallurgy, the use as a polishing powder and dyeing agent in glass and ceramics as well as the use of rare earth micro-fertilizer to increase yield of grain crops or as an additive in animal feed in agriculture, according to the Baotou Rare Earth Hi-Tech Development Zone website. Rare earth elements, when added to materials, either improve the quality of the materials or create totally new materials.

The PRC, as a developing economy and the worldwide leading supplier of REEs, places great importance on rare earths in the securing of their economic prosperity.

The supply chain of these products begins with the rare earth elements in the earth's crust where the physical and chemical properties are divided among the less abundant heavy REEs, (with distinct magnetic characteristics), and the lighter rare earth elements. There are 17 elements of which 15 are known as lanthanides on the chemical periodic table. These rare earths are mined, processed into powders and intermediate magnet materials (metals and alloys) and into finished neodymium-iron-boron (NdFeB) magnets which are critical to clean energy technologies such as electric motors in hybrid vehicles and in wind turbines.

Neodymium is required in quantities of 2-4 tons for each wind turbine and 2-4 pounds goes into each electric motor in a hybrid vehicle. Dysprosium and terbium are essential to light weight electric motors



and efficient lighting. Dysprosium prices increased sevenfold since 2003 to US \$53 a pound. Terbium prices quadrupled from 2003 to 2008 to US \$407 a pound, then dropped after the financial crisis to US \$205 per pound, according to a December, 2009 *New York Times* article.

The PRC is the world's leader in accessible concentrations of rare earths, accounting for 95% of rare earths produced and is number one in consumption and exports. The Baotou, Inner Mongolia Autonomous Region is the primary source of China's rare earths with over 50% of resources; the rest of the mines are in the southern provinces of Guangdong and Jiangxi. "In 2008, the Baotou Rare Earth High-Tech Development Area had a gross output value of \$664,179,104 and rare earth total production of 70,000 tons which accounted for 50% of the world's total production," said the Baotou spokesperson.

The competition among all rare earth producers caused a sharp decline in prices of rare earth exports to the detriment of overseas rare earth mines. Since 1990, Chinese exports grew nine times and prices dropped by 36%, according to *China Daily*, "Rare Earth Industry Adjusts to Slow Market," September, 2009. The article stated that China's current rate of

rare earth mining could deplete all of its sources in the next 20 to 30 years.

To control the over-exploitation of rare earths, the PRC Ministry of Industry and Information Technology is creating more regulations and rules for the rare earth industry and issued policy reports in October, 2009. The aim is to consolidate the industry, improve technology to reduce mining pollution by instituting an export tariff, stabilize prices and bring more foreign investors to Baotou for higher value production of rare earths. Many of the smaller mines in the south of China are unlicensed and damaging the environment. The combined effect is creating much uncertainty in developed economies.

However, developed economies are not surprised by the policy proposal to cap exports of rare earths at 35,000 tons per year from 2010-2015. "It is quite clear that China has been significantly reducing its rare earth export quotas every year for over six or seven years now. Hence, the message has been there for some time," said Mark A. Smith, Chief Executive Officer, Molycorp Minerals, LLC, USA in a recent interview.

Details on these policies are guarded as a national secret and the General Research Institute for Non Ferrous Metals in Beijing declined an interview.

The United States, Canada, Australia, England and Japan are bringing mines, home and abroad, on stream to create reliable supplies. Industry reports indicate demand for rare earth elements will be 200,000 tons per year by 2014.

Molycorp Minerals' Mountain Pass, California rare earths mine is planning to modernize infrastructure, to mine and process rare earth elements and produce intermediate and finished magnets in three phases over the next few years. The mine was forced to close in 2002 due to low priced imports from China. Molycorp's agenda is to be a partner in rare earth resource development. Can the Molycorp Minerals mine and other developed countries' mines produce fast enough to meet the demand for clean energy and military technologies? International cooperation and coordination is paramount in the worldwide rare earths industry to balance supply and demand. Molycorp appears to have the most abundant rare earth deposit on the planet, outside of China.

"The PRC is looking for a way to address the problem we all see – China will simply not be able to supply the rest of the world with enough rare earths to meet our needs and we must have alternative sources brought on line quickly," said Smith. ■

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