

# STRATEGIC METALS

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

## iNeed Rare Earth's

Smaller, faster, smarter. Technological advances have reduced the size of electronic devices whilst endowing them with ever more speed, intelligence, and functionality making them ever more personal and indispensable.

Rare earths play a huge role in almost all electronics and green technologies today, and judging by the unprecedented pace at which the world is embracing smartphones and tablets, our dependence on rare earths is rising exponentially. Such dependence certainly won't wane until an alternative is discovered.

Of the 17 rare earth elements in the periodic table, Neodymium, Yttrium, Lanthanum, Cerium, Europium, Terbium, Dysprosium, Praseodymium and Gadolinium are most widely used in the electronics industry, in green technologies and in the defense and avionics industries.

It's a well-known fact that Apple's iPhones and iPads are almost entirely made in outsourced Chinese facilities and that a considerable amount of rare earth minerals can be found in these popular devices.

China's monopoly of the rare earths industry and its export quota restrictions have encouraged most big players in the world's electronics industry to establish manufacturing facilities in China. With low-cost Chinese labor, much of the costs involved in manufacturing iPhones and iPads is attributable to technology costs and the cost of rare earth minerals. The table in Figure 1 lists the export prices of the metals and their oxides. Since China's domestic prices for these metals and oxides are

much lower, it makes perfect sense for Apple to manufacture its smartphones and tablets in China.

One of the most striking features of iPhones and iPads are their colorful displays. Yttrium is used to produce the white and grey phosphors; Europium produces the red phosphors and also acts as an activator for Yttrium phosphors; green phosphors are produced by Terbium. While trivalent Europium produces red phosphors, divalent Europium produces a range of blue colors. Dysprosium, Gadolinium, Lanthanum and Praseodymium are also used to make the color screen.

Rare Earth Element	Price of Metal	Price of Oxide
Cerium	27-32 \$/kg	14,000-16,000 \$/mt
Dysprosium	1,100-1,150 \$/kg	720-750 \$/kg
Europium	3,100-3,120 \$/kg	1,800-1,820 \$/kg
Gadolinium	130-135 \$/kg	62,000-67,000 \$/mt
Lanthanum	22-26 \$/kg	13,000-15,000 \$/mt
Neodymium	105-115 \$/kg	80,000-85,000 \$/mt
Praseodymium	110-120 \$/kg	80,000-85,000 \$/mt
Terbium	2,300-2,400 \$/kg	1,350-1,450 \$/kg
Yttrium	100-110 \$/kg	55,000-60,000 \$/mt

Fig. 1 Rare earths used in iPhones, iPads (prices FOB China as on 25 Oct, 2012. Source: [www.metal-pages.com](http://www.metal-pages.com))

The sleek polished look of the new iPhones and iPads is the result of glass polishing using the rare earth oxides of Cerium, Lanthanum and Praseodymium.

Neodymium and Dysprosium are used in the circuitry, speakers and vibration unit of these popular devices. Both these rare earths as well as Praseodymium exhibit strong magnetic properties. Praseodymium and Gadolinium can be found in the circuitry and speakers, while Lanthanum could be a component of the batteries that are used in iPhones and iPads. The magnet in the iPad's Smart Cover is thought to be a Neodymium alloy. Gadolinium oxide could be present in the fast, high-capacity flash memory.

With booming consumerism, high-tech lifestyles, emphasis on green power and the growing number of rare earth applications there could be a huge shortfall of Dysprosium, Neodymium, Terbium, Yttrium and Europium by 2015.

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*

## Copper: a Strategic Metal?

If your country's main goal is to develop long term electrical infrastructure and distribution, then yes, Copper is certainly a strategic metal. However, as a reflection of the sluggish economy, Copper dropped to a low of \$7,930 per metric ton on the London Metal Exchange (LME). And the International Copper Study Group (ICSG) predicts that, despite the slowdown, the world demand for refined copper in 2012 will exceed supply by around 400,000 metric tons making it the third consecutive year of production deficit.

According to the US Geological Survey, Chile has the world's largest copper reserves at 190,000 tons, followed by Peru with 90,000 tons and Australia with 86,000 tons. The ICSG's World Copper FactBook 2012 states that in 2011, Chile was the largest copper producer with an output of 5.3 million tons which accounted for one-third of the world's copper mine production. China, Peru, and USA produced over 1 million tons each, while Australia, Russia, Zambia, Canada, Indonesia, Mexico, Congo and Poland each produced between half a million and 1 million tons of copper.

Chile's Codelco, the single largest copper producer in the world, holds 20% of the world's copper reserves. The state-owned company achieved a record production of 1.735 million tons of copper in 2011 even though it struggled with strikes, bad weather and poor energy infrastructure.

Phoenix based Freeport-McMoRan was the second largest copper producer in 2011 with a production of 1.68 million tons. The company operates copper mines in North America and South America, besides owning stakes in the Tenke mine in the Democratic Republic of Congo and the Grasberg mine in Indonesia.

BHP Billiton, with headquarters in Melbourne, produced 1.64 million tons of copper. BHP is a major stakeholder in the Escondida mine in Chile which is the second largest copper mine in the world producing around 240,215 tons of copper.

Glencore International (Baar, Switzerland) is set to buy out Xstrata this year and become the third largest copper producer, pushing BHP to fourth place. In 2011 Xstrata produced 889,000 tons of copper while Glencore produced 628,000 tons. Glencore has firmed up its position in Africa by acquiring majority control in the Mutanda mine in the Democratic Republic of Congo.

London-based Anglo-American produced 645,000 tons of copper in its Chilean mines. With the completion of its expansion plans, the production at the company's Los Bronces mine is expected to double from 221,000 tons per year. Grupo Mexico produced 598,000 tons, while Rio Tinto, Southern Copper and KGHM Polska Miedz accounted for 591,700 tons, 587,400 tons and 543,000 tons respectively.

Copper production has picked up in Zambia and the country is expected to generate around 1.5 million tons annually in the next five years. However, safety concerns are an issue at the country's Chinese-owned mines. In August this year, mining in Zambia was under a cloud due to violent riots and striking workers.

Copper producers face problems of insufficient energy infrastructure, resource nationalization and labor strikes, especially in emerging economies. Despite these constraints, the ICSG forecast indicates that there will be around 458,000 tons of surplus copper by 2013. This can only mean that copper prices can be expected to fall further. One of the reasons for this is that China, the world's largest consumer of copper (accounted for almost 40% of copper demand in 2011) is going through a slowdown phase. China's stimulus measures to boost the economy will probably be shelved until the new leadership takes over next spring. With the slowing domestic demand for copper, Chinese producers like Jiangxi Copper Company are looking at cutting back on domestic sales and increasing exports to take advantage of strong LME prices.

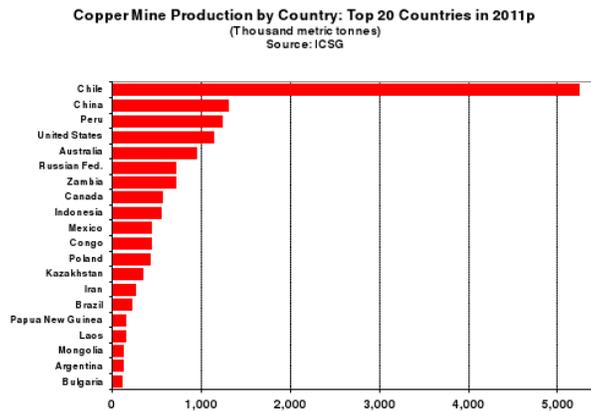


Fig.1. Copper Mine Production by Country (ICSG World Copper Factbook 2012)

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