



## **Summary of rare earth applications and key areas of use: (from Reuters)**

**Catalysts** - Petroleum cracking catalysts and auto catalysts use lanthanum and cerium.

**Glass** - Cerium is the major constituent of this sector, where it is used in ultra-violet light filtering.

**Polishing** - A rapidly growing sector that is based on the unique chemical and mechanical properties of cerium in the polishing of glass, including multi-level electronic components.

**Metal Alloys** - Nickel metal hydride (NiMH) batteries are the key driver of demand and could put pressure on lanthanum supply.

**Magnets** - Currently, the most dynamic market for rare earths with growth in demand increasing at 15 percent a year for the past 10 years, causing neodymium and terbium to increase by more than 40 percent over the past 12 months.

**Phosphors** - Necessary for the production of phosphors for TVs and energy-efficient lamps. This is the smallest sector by volume (only 6-8 percent) but the largest sector by value (30-40 percent) as europium and terbium are among the rarest of rare earths.

**Ceramics** - Yttrium stabilized zirconia is used throughout the resources industry where a material with high-wear resistance is required.

## **USES IN DEFENSE INDUSTRIES**

Lanthanum night-vision goggles

Neodymium laser range-finders, guidance systems, communications

Europium fluorescents and phosphors in lamps and monitors

Erbium amplifiers in fiber-optic data transmission

Samarium permanent magnets that are stable at high temperatures

Samarium precision-guided weapons

Samarium "white noise" production in stealth technology

## **MAGNETS**

Rare earth magnets are widely used in wind turbines. Some large turbines require two short tonnes of rare earth magnets, which are very strong and make the turbines highly efficient. Rare earth magnets are used in turbines and generators in many alternative energy applications.

## **HYBRID CAR BATTERIES**

Every hybrid-electric and electric vehicle has a large battery which is made using several pounds of rare earth compounds. The use of electric vehicles is expected to increase rapidly, driven by energy independence, climate change and other concerns. This is a key growth area for rare earths.

## **MOBILE PHONES, LAPTOPS**

Rechargeable batteries used in mobile phone and portable computers require rare earths, which were the key to smaller more efficient battery technology.

## **WORLD MINE PRODUCTION AND RESERVES (2009 data)**

Country	Production (Metric Ton)	Reserves (Metric Ton)
United States	insignificant	13,000,000
Australia	insignificant	5,400,000
Brazil	650	48,000
China	120,000	36,000,000
India	2,700	3,100,000
Malaysia	380	30,000
Others	not available	22,000,000
World total	124,000	99,000,000

*Sources: Arafura Resources Ltd, USGS, Thomson Reuters*

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