Rare Earth Elements

The rare earth elements (REEs) are a group a 17 chemical elements including 15 lanthanides, with the addition of yttrium (Y) and scandium (Sc), due to the reason that they possess similar phisical and chemical properties. While having the name of rare earth, the elements are not necessarily rare in existence. Rare earth elements can be found in almost all massive rock formations. However, REEs are scarece as a mineable resource. The limited availability of rare earth ores reflects a number of factors including the geological controls that affect not only their distribution but underlie technical mining and processing constraints (Golev et al., 2014).

In recent years, rare earths became increasingly valued as they represent a higher standard for current technologies. They are widely applied to hi-tech applications, including phosphors, batteries, and permanent magnets that are esstential in products such as microphones, in-ear headphones, hybrid vehicles and hard disks. Apart from their value in industrial use, their ability to promote green economy is another favorable factor as environmental issue is now receiving great concern.

The world distribution of rare earth elements is highly unbalanced, with Chinese soil taking up 55,000,000 metric tons out of 110,000,000 metric tons, approximately 50% of total reserves worldwide (US DoE). When it comes to producing REEs, China is the absolute dominant producer of rare earth minerals, owning over 95% of the world output (USGS, 2011). As China adopted protectionist policies to restrict its export quotas of REEs several years ago which resulted in skyrocketed prices, it motivated other countries that relied heavily on REEs for production such as Japan, US and Europe, to explore deposits outside China.

According to Massari and Ruberti (2013), the prices of rare earths have gone through dramatic increase followed by a substantial fall in the past few years. Europium, among all REEs, had the most significant increase, with its price experienced a 580% acute hike from 450 US$/kg to 5870 US$/kg in 2011, then plummeted to 4010 US$/kg after one year. As of last week, the price of europium was maintained at a level of 1000 US$/kg (Metalpages, 2014). As the research pointed out, the prices of eight rare-earth oxides with hightest commercial interest, namely lathanum, cerium, neodymium, praseodymium, samarium, dysprosium, europium and terbium, have had a particularly strong demand and price growth, the explosion of prices between 2010 and 2011 were deemed to be correlated with dynamics of supply rather than those of demand. As a matter of fact, China announced on September 1, 2009 implementing mining quotas, imposing a great concern on the supply side of REEs, the sequential soar in prices followed.

Prices of REEs are difficult to predict, based on their historical performance, the prices were subject to influences of not only supply and demand, but also important speculative pushing phenomena and generalized concerns about a sudden supply shortage of these resources in the coming years (Massari and Ruberti, 2013). In the investment prospective, ETF investing in companies that produce REEs started trading only 4 years ago, its 3-year total return, however, yielded a disappointing -26.59% (Yahoo Finance, 2014).

One way to battle with the declined supply from China is to explore alternatives, more specifically, artifical substitutes of REs, however, many REs are considered irreplacable. Another more advantageous solution, is the recycling of hi-tech wastes and recovery of REs, the purposes behind which are both economic and environmental (Golev et al., 2014). The cost of the recycling process is not negligible, however, it can offer an opportunity to reprocess the most desired elements.

In conclusion, along with the evolution of technology, the application of REs is very promising. The demand of certain elements will likely to be reaching a new high in the future, the main concerns brought out by several papers are similar, the stable supply of elements, the obstacles encountered in recycling process, and the costly measures to mitigate radioactive byproducts in the extraction process. The sustainability of the industry would require

more effort in the long run.