Rare earths, source of progress and conflicts

Part 3 – Extraction technologies

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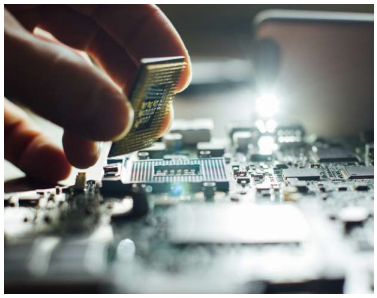
The concentrates of rare earth (RE) ores are processed through chemical treatments involving either acid or basic conditions. The main task is to increase the concentration of rare earth elements up to 90% and to leach out some impurities such as uranium, thorium (weakly radioactive) and iron.
Sulphuric acid, hydrochloric acid, and nitric acid are some of the reactants employed through the acidic route. That results in the releasing of gases, which are harmful for the environment and the human health. Examples are hydrogen fluoride, silicon tetrafluoride, and sulphur oxides. The Bayan Obo mine in China – with the currently largest rare earth deposits in the world – uses this method [1]. When treating ores under basic conditions, caustic soda and sodium carbonate are used.
After the removal of the impurities, the rare earth elements are extracted using organic solvents. [1]
Here, we would like to refer to our first article in this series: rare earths are not that rare because of the scarce occurrence on the Earth´s surface, but because of the difficulty of their extraction methods. This is where, **the core of the discussion begins**. The extraction of rare earth elements is prevented in most countries, as the associated environmental burdens – large amounts of toxic and radioactive wastewater and solids – face a strict environmental standard.
Consequently, China is not only the largest producer of rare earth ores, but also the largest refiner. Huge amounts of rare earth ores mined in other countries are shipped to China to be refined in existing plants with at least questionable environmental standards. That makes China the undisputed leader in the market of rare earths.

In the following post, we will discuss further about the role of China in the rare earths market and how it became part of its international policy.



[1] Suli, L., Ibrahim, W. H., Aziz, B., Deraman, M. R., & Ismail, N. (2017). A Review of Rare Earth Mineral Processing Technology. Chemical Engineering Research Bulletin, 19, 20-35