Impact of Rare Earth Materials on Environment

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Abstract— United Nations Has Set Some Standards for The Protection of Environment and Thus Levied the Step to Put Forward the Ground for Sustainable Development Goals (SDGs)Way Back In 2015.Hence to Safeguard and Protect Environment It Is Time to Address This Issue and Protect Our Environmental Wealth. It Ensures Protection of Human Well Being, Economic Prosperity and Environmental Protection. Out Of Them One of Them Is Impact of Extraction and Is Recycling of Rare Earth Elements and Comparison of All Categories of Rare Earth Elements Because Of Their Wide and Beneficial Applications.

Index Terms- Rare Earth Element, Sustainable Development Goals

I. INTRODUCTION

The Publication of Sustainable Development Goals by United Nations In 2015 Has Set Important Ground for The Progress of Developed and Developing Nations in Future. It Is Comprised Of 17 Goals And 169 Targets It Aims in Keeping Track to Challenges Faced by Humans. These Goals Focus on Achieving an Outcome by Changing Behaviour Related to Any Aspect of The Environment or Environmental Policy. Out Of Them Is Purification of Water and Treatment Comprises of Elements Like Rare Earth Elements.

II. ABOUT RARE EARTH ELEMENTS

The diverse properties of rare earth materials have been broadly applied and with growing applications in varied fields, including clean energy technologies, pollution control etc. Rare earth elements are basically 15 elements in the Lanthanide series, including yttrium and scandium. Yttrium and scandium are the rare earth elements found mostly in deposits and have same chemical properties. Broadly classify the rare earth elements into three categories.1.) light rare earth elements, including lanthanum, Cerium, Praseodymium, Neodymium and Promethium. 2.Medium rare elements, including samarium, Europium and Gadolinium and 3.) Heavy rare earth elements, Terbium, Dysprosium, Holmium, Erbium, Thulium, Ytterbium, Lutetium, Scandium and Yattrium. There are 200 known rare earth mineral deposits mostly known as carbonates around the world. Out of them, Cerium is the most abundant than lead too, but rare earth elements have much less tendency to become concentrated in exploit table ore deposits. And they are mostly comprised of Heavy Rare Earth Elements. Rare earth elements have wide range of applications and are very useful in times to come including nuclear, metallurgical, chemical, catalytic and much more applications broadly extended to the higher studies like glass polishing and highly specific flints. Futuristic applications are in field of safe storage, etc. Many environmental issues surround the production and use of rare earth elements, having same type of chemical structures are different to separate and have low yield of less than0.6%. Thus, apart from electricity acids, water, there can be huge, amount of water that is potentially toxic to ecosystem. one concern of rare earth pollution related to the contamination of the local environment. These include potential by accumulation in the food chain from the water or the dust, contamination of waterways and soil from mines when used in the downstream industrial processes[1,2].The study investigates the global warming, impact and intensity of use of energy and resources in the production of Rare Earth Oxides and Rare Earth Elements which are very important each of the distinct stages, including mining separation of Rare Earth Oxide and reduction to Rare Earth Elements and is modelled as per, the input of sources like water, etc

- Sources and distribution of rare earth, minerals:

only a few phosphates and the carbonates have been recovered for the commercial production of rare earth elements across the world. Out of them Bastanite cons Out of these best units constitutes the percentage

monazite majorly in Australia, Brazil, China, India, Malaysia, South Africa, Africa, Sri Lanka, Thailand, and United States of America. Out of the whole 95% of the worlds Rare Earth Elements are majorly produced in China and bayan obo mine supplies, the majorly iron, Miobium etc. The projection production is expected to be between 8000 and 10,000 metric ton and moreover, REE element stocks has been exported to Malaysia and Australia as well. As Rare earth elements are hard to isolate due to small differences in solubility and the complex formation, does, the separation of rare element involves iron exchange, solvent, extraction, absorption, technology, or fractional crystallisation method.

- Mining and Beneficiation:

In China in separation, bastanite and monazite a combination of separation process, including wet, magnetite and froth, flotation process,

- Purification and Separation of Rare Earth Oxide:

Amount of bastnasite and monazite is 85% concentrated by weight within the slurry which was concluded by Sinton et.al[3]. This stage purify and separates the light, medium and heavy oxide groups, incorporating different processes. Monazite with extensive amount of radioactive material is more energy and chemical intensive than bastanite.

Then extraction of Rare EarthOxide group produces Cerium and all other Rare Earth Elements in total. And the separated strains thereafter further processed individual Rare Earth Oxides. using different stages of , light rare earth oxides, medium rare earth oxides and heavy rare oxides and hence could be separated.[4,5]. Currently, rare earth oxides are separated by using ion exchange and absorption with reagent impregnated resin also[6].

- Reduction of rare earth elements:

The industrial reduction to rare earth elements from light rare earth elements uses fused salt electrolysis method for medium rare elements and higher rare earth elements by metallothermic process using electrolysis from an simple carbon based pyrometallurgy is employed due to electropositive nature of rare earth elements in these groups .[7]

- Methodology and assumptions

The main objective of the study is to understand this extraction of rare earth by elements in order to understand non-renewable energy use from water and its presence causing toxicity in aqua waters of Yamuna. Thus, finding out the availability from Yamuna rivers from mining digging to the time it is sold, this study has been focused. This model underlying the economic and environmental reasons of the research. Economic allocation is preferred on the share and concentration of the contribution of each product that can be calculated by the mass allocation formula and are adjusted accordingly.

$Xc=PcCc/\Sigma c(PcCc)\sim\sim$ ...(1)
$Ci=Cbbi+C_m mi$ ..... (2)
$Xi=PiCi/\Sigma i(PiCi)$.....(3) Where,
Ci=Mass Based Allocation, bi=Bastnasite, mi=Monazite
Cb=Ratio of Bastanite C_m=Ratio of Monazite
Pi=Price per kg(Share of Environmental Burden)
Xi=Share of Environmental Burden

which comes out to be

3:1 ratio in which bastnasite:Monazite were approximately found.
which is in proportion in the Banya Baya obo mineral deposit, and blast with other rare metals, such as Gadolinite, and other materials containing rare oxides.
Environmental impact

Is of lower rare earth oxides have lower impact than the rest of the rare earth oxide whuich includes lithium and cerium, being minerals within light, rare oxide groups .

CONCLUSION

Recycling is an attractive pathway, giving the increase in prices of the rare earth. Combine with the recent data route of recycling will be a closed loop ,meaning recovery of rare earth, alloys within minimum loss of property for similar application. Such recycling has challenges of collecting ,sorting ,separating components and finding suitable processes An open loop Recycling can be recovered from rare elements .An assessment of these and other impacts from waste

processing and the disposable in particular large amount of tailings is produced in an extraction of bastnasite and monazite concentration , tailings of the both of these monazite among it particularly contain natural occurring radionuclides and the release of this to the environment by air waste, water and rain cleaning can have longer term health effects to humans and ecosystem and to the local environment. This might may bring closer to the achievement of sustainable development goals 2015 0f united nations.

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