

MANAGEMENT • INVESTMENT • ECONOMICS • ENTREPRENEURSHIP • TECHNOLOGY

FIVE IMPORTANT TIPS TO HELP NOVICE
ATHLETES IN SPORTS CONFIDENCE

Turmeric & Coffee

The Suprising Ingredient Generating Short-Pulsed Laser

EMAIL CARBON FOOTPRINT

A SOURCE FOR GREENHOUSE GASES EMISSIONS

Creating Happiness

IN WORK AND LIFE IN SOCIETY: A RELIGIOS PERSPECTIVE

Teknik Pengucapan

BARACK OBAMA

eISSN 2600-9811

9 772600 981003
Publication Date
7 November 2023

An SPR biosensor typically comprises two main components: an optical system that excites and interrogates surface plasmons and a biomolecular recognition element that is immobilized on a metal layer and used to capture and identify target analytes in a sample, as shown in Figure 1. When a food sample is introduced to the biosensor, any analytes present in the sample that bind to the recognition element cause a change in the refractive index of the metal layer, which is detected through the shift in the SPR signal. This shift is proportional to the amount of bound analyte, allowing for the precise quantification of contaminants or pathogens and the determination of binding kinetics, specificity, affinity, and concentration of biomolecules in the food sample. The change in refractive index is caused by variations in mass and chemical reactions occurring on the sensor surface during the binding event. The binding rate gradually decreases until the association and dissociation processes reach equilibrium. Additionally, the surface temperature can affect the refractive index.

In summary, SPR is a powerful label-free, highly sensitive, and real-time technique for studying the interaction between biological molecules on the surface of a sensor. It has various applications, including the detection of adulteration, biomolecules such as proteins, carbohydrates, vitamins, antioxidants, and nucleic acids, as well as in the detection of genetically modified foods, microorganisms, and more (Ravindran et al., 2023). The continued development of SPR biosensors with improved sensitivity and selectivity will likely expand their application in the future.

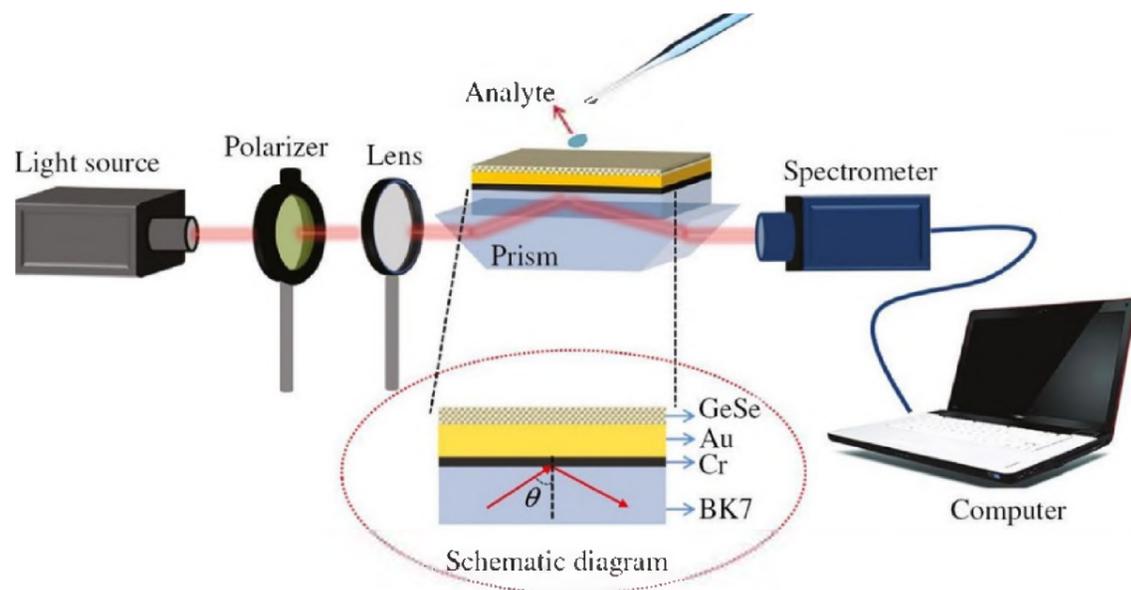


Figure 1. The basic experimental setup of an SPR biosensor (Zhao et al., 2020)

References:

- Ravindran, N., Kumar, S., M, Y., S, R., C A, M., Thirunavookarasu S. N., & C K, S. (2023). Recent advances in Surface Plasmon Resonance (SPR) biosensors for food analysis: a review. *Critical Reviews in Food Science and Nutrition*, 63(8), 1055-1077. <https://doi.org/10.1080/10408398.2021.1958745>
- Zhao, Y., Gan, S., Wu, L., Zhu, J., Xiang, Y., & Dai, X. (2020). GeSe nanosheets modified surface plasmon resonance sensors for enhancing sensitivity. *Nanophotonics*, 9(2), 327-336. <https://doi.org/10.1515/nanoph-2019-0170>

RARE EARTH ELEMENTS (REES) 101 :



Faizatul Akmam Binti Amirrudin

Faculty of Business and Management, UiTM Cawangan Selangor Kampus Puncak Alam

Nik Noor Afizah Azlan

Faculty of Business and Management, UiTM Cawangan Terengganu Kampus Dungun

WHAT IS REE ?

➤➤➤ RARE EARTH ELEMENTS (REE)

Rare Earth Elements (REEs), a set of seventeen chemically similar but unique elements, have emerged as critical components in modern technology, industry, and scientific advancement. These elements, which are found in the bottom two rows of the periodic table, possess unique electronic, magnetic and optical properties that make them important in a variety of applications.

RARE EARTHS ARE CATEGORISED INTO LIGHT ELEMENTS (LANTHANUM TO SAMARIUM) AND HEAVY ELEMENTS (EUROPIUM TO LUTETIUM). THE LATTER ARE LESS COMMON AND CONSEQUENTLY MORE EXPENSIVE.

Rare earth elements are quite prevalent in the planet's crust, with cerium ranking 25th at 68 parts per million. This makes it as plentiful as copper (Lynas rare earth, n.d.). Despite their name, rare earth elements are not particularly rare in occurrence; rather, their dispersion and extraction difficulties have contributed to their classification as "rare." Chemically, rare earths are strong reducing agents. Their compounds are generally ionic and they display high melting and boiling points. Rare earths are relatively soft when in their metallic state while those with a higher atomic number tend to be harder. Rare earths react with other metallic and non-metallic elements to form compounds each of which has specific chemical behaviours. This makes them indispensable and non-replaceable in many electronic, optical, magnetic, and catalytic applications. Rare earth compounds are commonly fluorescent under ultraviolet light, which can assist in their identification. Rare earths also react with water or diluted acid to produce hydrogen gas (Lynas rare earth, n.d.).

Rare earth elements (REEs) have grown in importance over the last decade as consumer electronics, electric vehicles, clean energy, and military equipment have grown in popularity. To accomplish advanced technological advancement, the development of REEs as a strategic mineral in modern society (MIDA, n.d.). This group of elements is used in the production of everything from smartphones and electric vehicles to renewable energy systems and advanced medical devices. As we delve deeper into the multifaceted world of rare earth elements, we uncover their significance in shaping the modern world and driving innovation across numerous sectors.

WHAT ARE REES USED FOR?

Rare Earth Elements (REEs) find application in a diverse range of industries and technologies due to their unique properties. REEs are widely used for a variety of purposes, including:

ELECTRONICS AND TELECOMMUNICATION

REEs are essential for the production of various electronic devices, including smartphones, tablets, laptops, and flat-screen displays. They are used in the production of phosphors for LED screens, as well as in the magnets and electric motors found in devices like hard drives and headphones.

CATALYSTS AND CHEMICAL PROCESSES

REEs are used as catalysts in various chemical reactions, particularly in petroleum refining and environmental applications. Cerium is used in catalytic converters in vehicles to reduce emissions.

CONSUMER ELECTRONICS

REEs are found in various consumer electronics, including speakers, microphones, and headphones, due to their ability to generate high-quality sound.

LASER TECHNOLOGY

Neodymium-doped lasers are used in various applications, including laser engraving, laser cutting, and medical lasers for surgical procedures.

NUCLEAR ENERGY

Some REEs have uses in nuclear reactors and fuel cells, contributing to the efficiency and safety of these technologies.

WATER TREATMENT

Cerium and lanthanum are used in water treatment processes to remove impurities and purify drinking water.

CLEAN ENERGY TECHNOLOGIES

REEs play a critical role in renewable energy technologies. Neodymium and dysprosium, for example, are used in the production of high-performance magnets for wind turbines and electric vehicle (EV) motors. REEs are also used in rechargeable batteries for hybrid and electric vehicles.

MEDICAL EQUIPMENT

Some REEs are utilized in medical imaging equipment, such as MRI machines. Gadolinium-based contrast agents are used to enhance the visibility of specific tissues during MRI scans.

DEFENSE AND AEROSPACE

REEs are integral to the production of advanced defense technologies, including missile guidance systems, radar systems, and night vision equipment. They are also used in aerospace components due to their lightweight and high-strength properties.

GLASS AND CERAMICS

Cerium is used in glass polishing, and yttrium is used in the production of high-temperature ceramics for applications like jet engines.

AUTOMOTIVE INDUSTRY

Apart from EVs, REEs are used in conventional vehicles as well. They are used in sensors, catalytic converters, and ignition systems.

PRECISION INSTRUMENTS

Some rare earth elements are used in precision instruments like atomic clocks and GPS devices.

WHERE ARE REE FOUND?

The first rare earth was discovered in 1787 in a Swedish village (Lynas rare earth, n.d.)

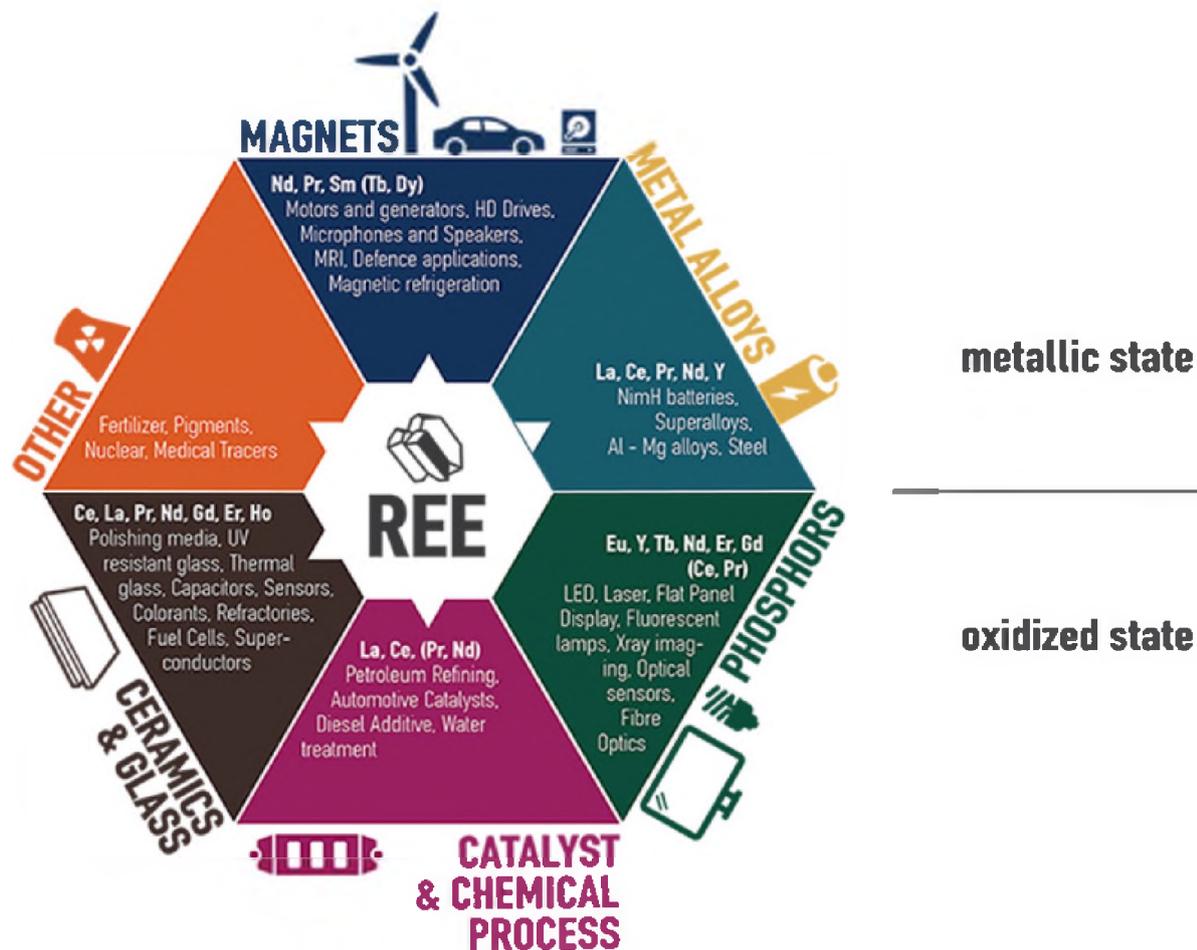
Rare earth elements are abundant all over the planet. Even our own backyards may contain trace amounts of rare earths, possibly a few parts per million. Although the rarest rare earth is nearly 200 times more abundant than gold, these oxidised minerals are considered to be rare because most deposits are of very low quality and concentration, making them uneconomical to mine (Lynas rare, n.d.). According to the [USGS Rare Earths Report](#), the principal economic sources of rare earths are the minerals bastnasite, monazite, and loparite and the lateritic ion-adsorption clays.

The elements range in crustal abundance from cerium, the 25th most abundant element of the 78 common elements in the Earth's crust at 60 parts per million, to thulium and lutetium, the least abundant rare-earth elements at about 0.5 part per million. Rare earth minerals are currently produced in seven countries and regions, including China, Russia, the United States, Australia, India, Brazil, and Malaysia. Lanthanum and cerium accounted for approximately 60% of global rare earth use in 2012, followed by neodymium, yttrium, and praseodymium. The first rare earth was discovered in 1787 in a Swedish village (Lynas rare earth, n.d.)

China remains the world's greatest producer of rare earths. Inner Mongolia and Sichuan are the most important provinces for Chinese production. In 2022, the United States was the world's second-largest producer of rare earth elements, with 43,000 metric tonnes of bastnäsite mineral concentrates in rare earth oxide equivalent and 250 metric tonnes of rare earth compounds and metals produced. Nonetheless, the United States is a major importer of rare earths. As of 2021, China accounted for over three-quarters of all US rare earth imports, with the remainder coming from Malaysia, Estonia, Japan, and other countries (Garside,2023)

CONCLUSION

Rare Earth Elements (REEs) play an important role in modern society, enabling different technological advances and breakthroughs. These elements are required in the manufacture of electronics, renewable energy technologies, defence systems, and a variety of other uses. The global demand for rare earth elements (REEs) is increasing as our reliance on high-tech products and renewable energy sources grows. This demand, combined with current supply dynamics and increased public sector assistance, has the potential to benefit companies across the entire REE value chain.



References

Garside, M. (2023, August 30). Rare earth elements - statistics & facts. <https://www.statista.com/topics/1744/rare-earth-elements/#topicOverview>

Lessard, M. (2020, January 28) Where are rare elements found? <https://www.thermofisher.com/blog/mining/where-are-rare-earth-elements-found/>

Lynas Rare Earth. (n.d.). Rare earths are a group of chemical elements with unique magnetic, luminescent, and electrochemical properties. <https://lynasrareearths.com/products/>

MIDA (n.d.). Gearing Malaysia as a rare earth elements (REEs) powerhouse. <https://www.mida.gov.my/gearing-malaysia-as-a-rare-earth-elements-rees-powerhouse/>

Ruid, M. (2023, July 13) Rare earth elements, explained. <https://www.globalxetfs.com/rare-earth-elements-explained/>

USGS (n.d.). Rare earths statistics and information. <https://www.usgs.gov/centers/national-minerals-information-center/rare-earths-statistics-and-information>

World Population Review (n.d.). Rare-earth reserves by country/rare earth metals by country 2023. <https://worldpopulationreview.com/country-rankings/rare-earth-reserves-by-country>



BizNewz 2023
Faculty of Business and Management
Universiti Teknologi MARA Cawangan Terengganu, Kampus Dungun
Sura Hujung, 23000 Dungun, Terengganu, MALAYSIA
Tel: +609-8400400
Fax: +609-8403777
Email: biznewzuitm@gmail.com