50 Years of Rare Earth Research in Malaysia: Past, Future Trend and What is Missing? A Bibliometric Analysis

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Abstract. The bibliometric analysis was conducted using R Bibliometrix software on 4,876 articles related to rare earth published by author from Malaysia. All the articles are indexed in Scopus from 1971 to 2023. The multidimensional analytical approach provided holistic view of the scope of rare earth research in Malaysia and its progression, the major topics, institutes, trends and gaps. Based on the general descriptive data analysis, the results showed that rare earth research has gained influence in Malaysia since 2009. A clustering analysis of the retrieved keywords showed that fiber lasers and saturable absorber in rare earth was the most frequently discussed topic. The study also revealed a major gap in this area especially on the upstream and middle stream study of rare earth. The gaps should be filled in order to position Malaysia as one of the rare earth powerhouse.

INTRODUCTION

The term "rare earth elements" refers to a set of 17 chemically related elements that may be found in the crust of the planet. Cerium, dysprosium, and neodymium are some examples of the elements that belong to this group. As a result of their one-of-a-kind chemical and physical qualities, rare earth elements find applications in a wide range of contemporary technology, such as mobile phones, wind turbines, and electric cars. In the 18th century, a Swedish army commander by the name of Carl Axel Arrhenius found a mineral that contained cerium [1]. This event is considered to be the beginning of the history of rare earth elements. However, the usage of rare earth elements in technology did not start to become widespread until the 20th century. In the 1950s, scientists established a method for isolating rare earth elements from one another, which made it feasible to employ particular rare earth for a variety of different uses. In the decades that followed, rare earth elements were used into a wide range of emerging technology, such as colour televisions, compact fluorescent light bulbs, and hybrid automobiles. Rare earth occurs in small quantities in many minerals, but the most commonly mined rare earth are found in bastnäsite and monazite. China is currently the leading producer of rare earth followed by Russia and the United States.

Studies on rare earths have recently taken center stage in the scientific community. The electrical structure, microscopic nature, and other unique properties of rare earth metals, alloys, and compounds have all been explored using a variety of techniques [2]–[4]. The so-called rare earths are now more widely available and of higher purity than ever thanks to a myriad of extraction and purification methods [5], [6]. The nature and characteristics of rare earths are now better understood thanks to scientific research, which is expanding their technological applications.

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