

**ASSESSMENT OF RARE EARTH ELEMENT
POTENTIAL IN DIFFERENT GEOLOGICAL
FORMATIONS OF SRI LANKA**

Batapola Dewage Nadeera Madhubhashani Batapola

198087R

Degree of Master of Philosophy

Department of Earth Resources Engineering

University of Moratuwa

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The above candidate has carried out research for the MPhil thesis under my supervision.

Name of the supervisor: Pof. A.M.K.B. Abeysinghe

Signature of the supervisor:

03.08.2023

Date:

Name of the supervisor: Prof. H.M.R. Premasiri

UOM Verified Signature

Signature of the supervisor:

03.08.2023

Date:

Name of the supervisor: Dr. L.P.S. Rohitha

UOM Verified Signature

Signature of the supervisor:

03.08.2023

Date:

ACKNOWLEDGEMENTS

First of all, I wish to express my sincere gratitude to my M. Phil supervisors, Pof. A.M.K.B. Abeysinghe, Prof. H.M.R. Premasiri, and Dr. L.P.S. Rohitha of the Department of Earth Resources Engineering, the University of Moratuwa for their proper guidance, supervision, and support to complete my research. I would also like to acknowledge the financial support provided by the research project “Potential of Rare Earth Elements (REE) in Sri Lankan Onshore and Offshore Terrains and Development of Extraction Techniques” under the Accelerating Higher Education and Development (AHEAD) Operation of the Ministry of Higher Education of Sri Lanka funded by the World Bank (AHEAD/DOR/6026-LK/8743-LK). Furthermore, my heartfelt gratitude goes to the rest members of the afore-mentioned project – Prof. N.P. Ratnayake (Principal Investigator), Dr. I.M.S.K. Ilankoon, Prof. D.M.D.O.K. Dissanayake, Prof. P.G.R. Dharmaratne, and Eng. N.P. Dushyantha for their immense guidance and support.

Moreover, I sincerely thank Dr. S.P. Chaminda, Head and the Research Coordinator of the Department of Earth Resources Engineering, University of Moratuwa, and all the academic staff members. I also wish to admire the continuous assistance provided by the non-academic staff of the Department of Earth Resources Engineering, the University of Moratuwa, in field visits and laboratory tests, especially to Mrs. A.R. Amarasinghe, Mr. S.S.U. Silva, Mrs. W.A.S.M. Wickramarachchi, Mr. W.R.M.D.M.B. Wickramasinghe, Mr. W.W.S. Perera, and Mr. S.D. Sumith. Furthermore, I would like to express my sincere thanks to Mrs. R.M.P. Dilshara for her assistance during the field visits, sample preparation, and laboratory testing.

Finally, I wish to dedicate my sincere gratitude to my family, friends, and all the individuals for their guidance, support, and encouragement to complete my M.Phil research.

ASSESSMENT OF RARE EARTH ELEMENT POTENTIAL IN DIFFERENT GEOLOGICAL FORMATIONS OF SRI LANKA

Abstract

In recent years, the global demand for rare earth elements (REEs) has been burgeoning due to the wide range of applications in numerous modern and green energy technologies. Although China was dominating the REE market, now the reliance on Chinese REE production has begun to ease with the global attempts to explore new REE resources outside China. This growing global competition coupled with demand escalations provides an opportunity for developing countries like Sri Lanka to start explorations for new viable REE sources to become a potential REE supplier to the global REE market. Therefore, the present study focuses on assessing the REE potential in different geological formations in Sri Lanka based on their origins and occurrences. Accordingly, representative samples from the Eppawala phosphate deposit (EPD) (n=60), Ginigalpelessa serpentinite deposit (n=32), beach placers on the northeast coast (Verugal: n=18 and Pulmoddai: n=26) and the southwest coast (n=18), alluvial placers in the Walave river basin (n=20), granites at Thonigala (n=17), Massenna (n=10), Arangala (n=6), and Ambagaspitiya (n=6), and Ratthota pegmatite (n=6) were analyzed for their REE contents. Based on the results, the EPD, Massenna and Arangala granites, and Pulmoddai deposit were the most prospective REE sources in Sri Lanka. However, due to technological and environmental challenges associated with granitic occurrences and the Pulmoddai deposit when converting them into exploitable mineral reserves, the EPD was identified as the most prospective source in Sri Lanka in the present study. Despite the relatively low REO grade ($\sim 0.48\% \sum \text{REE}_2\text{O}_3$) in the EPD compared to other similar global occurrences, this deposit is significantly enriched in critical and highly demanded REEs like Nd, Pr, and Tb. Therefore, with upgraded extraction techniques, the EPD could become a potential diverse source of REEs that may contribute to maintaining a sustainable REE supply chain in the future.

Keywords: Critical rare earth elements, Eppawala phosphate deposit, Pulmoddai deposit, Rare earth resources

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LIST OF ABBREVIATIONS

Abbreviation	Description
Ce/Ce*	Ce Anomaly
CREE	Critical Rare Earth Element
EPD	Eppawala Phosphate Deposit
Eu/Eu*	Eu Anomaly
HREE	Heavy Rare Earth Element
HREO	Heavy Rare Earth Oxide
ICP-MS	Inductively Coupled Plasma Mass Spectrometer
LREE	Light Rare Earth Element
LREO	Light Rare Earth Oxide
RE	Rare Earth
REE	Rare Earth Element
REO	Rare Earth Oxide
TREE	Total Rare Earth Element
TREO	Total Rare Earth Oxide